

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

industry and development

No. 13

UIC LIBRARY

MAR 18 1985

In this issue

DOCUMENTS

- 1 Attitudes in the Federal Republic of Germany to the policies of developing countries regarding foreign investors
Jürgen Riedel
 - 39 Manufacturing as an engine of growth—revisited
John Weiss
 - 63 Technological innovation and social cost benefit analysis in developing countries
David A. Phillips
 - 77 The Lima target and South-South co-operation: a statistical review
Secretariat of UNIDO
 - 83 Regional energy implications of the Lima target: a tentative quantitative assessment
Secretariat of UNIDO
 - 117 Books
-



UNITED NATIONS

INDUSTRY AND DEVELOPMENT

No. 13

INDUSTRY AND DEVELOPMENT

No. 13



UNITED NATIONS
NEW YORK, 1981



Digitized by the Internet Archive
in 2024

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

Vienna

INDUSTRY AND DEVELOPMENT

No. 13



UNITED NATIONS
New York, 1984

The opinions, figures and estimates set forth in signed articles are the responsibility of the authors and should not necessarily be considered as reflecting the views or carrying the endorsement of the United Nations Secretariat.

All material in *Industry and Development* may be freely quoted or reprinted, but acknowledgement is requested, together with a copy of the publication containing the quotation or reprint.

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers.

Mention of firm names and commercial products does not imply the endorsement of the United Nations.

AIMS AND SCOPE OF *INDUSTRY AND DEVELOPMENT*

Industry and Development attempts to provide a link between practitioners and theorists working on economic and related aspects of industrialization. The focus of the journal is on applied economics, particularly in areas emphasized in the Lima Declaration and Plan of Action on Industrial Development and Co-operation.

The journal is published an average of four times a year as an integral part of the work programme of the Division for Industrial Studies of the United Nations Industrial Development Organization. It is prepared under the general guidance of a Supervisory Panel, composed of staff members from the Division, with the Head of the Global and Conceptual Studies Branch as its chairman. Responsibility for the detailed supervision of a specific issue is rotated among the members of the Panel. The responsible member for this issue was J. Cody.

The Supervisory Panel of *Industry and Development* welcomes readers' opinions and comments.

ID/SER.M/13

UNITED NATIONS PUBLICATION

Sales No.: E.84.II.B.5

00700P

Explanatory notes

References to dollars (\$) are to United States dollars, unless otherwise stated.

The following abbreviations are used in this publication:

GDP	gross domestic product
GNP	gross national product
mboed	millions of barrels of oil equivalent per day
MVA	manufacturing value added
NIC	newly industrializing country
OECD	Organisation for Economic Co-operation and Development
S1	scenario one
S2	scenario two
S3	scenario three
SCBA	social cost benefit analysis

ATTITUDES IN THE FEDERAL REPUBLIC OF GERMANY TO THE POLICIES
OF DEVELOPING COUNTRIES REGARDING FOREIGN INVESTORS

Jürgen Riedel*

The purpose of the present article is to determine to what extent, if at all, the policies of developing countries regarding foreign direct investment or investors affect the investment policies and strategies of firms in the Federal Republic of Germany. More specifically, the object is to see which specific restrictions and conditions actually constitute obstacles to investment and to what extent, if at all, they prevent investment projects from being carried out. Whether these restrictions and conditions may be held responsible for the slower rate of growth of direct foreign investment by the Federal Republic in recent years is discussed.**

Methodology

The analysis in this article is based on a survey carried out in the summer of 1980, for which a questionnaire was completed by 233 firms in the Federal Republic of Germany and over 50 people were interviewed. The survey was confined to investment projects that had been implemented, postponed or abandoned during the previous five years or were being planned at the time. Further criteria made it possible to analyse the findings by size and sector of activity and by individual countries or areas.

In the main body of the questionnaire, information was requested on: the firm's reasons for direct investment (nine criteria); difficulties over which the developing countries or areas had no control (two criteria); obstacles encountered in the developing countries (three criteria), including a general verdict on the restrictions and conditions imposed by national economic policies; and individual types of restrictions and conditions (17 criteria).

The questionnaire called mainly for value judgements that could be aggregated to produce an opinion profile. The scale of the investment projects was not ascertained and could therefore not be used to weigh the opinions. Each firm's opinion carried the same weight. Firms' value judgements referred both to the significance of the reasons behind investment decisions and the changes that had been observed in them.

*IFO-Institut für Wirtschaftsforschung (Institute for Economic Research), Munich. The questionnaire upon which the study is based can be obtained from the author.

**This contribution is based on a research project carried out for the Federal Ministry of Economics by the IFO-Institute for Economic Research: A.J. Halbach, R. Osterkamp and J. Riedel, Investitionspolitik der Entwicklungsländer und deren Auswirkung auf das Investitionsverhalten deutscher Unternehmen (Munich, IFO-Institut für Wirtschaftsforschung, 1980).

The following rating categories were used in the survey:

<u>Actual significance</u>	<u>Comparison with previous significance</u>
1 (significant)	+ (up)
2 (less significant)	= (no change)
3 (minor)	- (down)

To simplify the analysis, an overall rating was compiled for these rating categories, in accordance with which replies giving a "1" or "+" assessment were given full value, those with "2" or "=" were given a half value and those with "3" or "-" were ignored. For each of the overall categories, the rating deviations were calculated and ranked for each of the four degrees of implementation, the four firm-size categories, the nine branches of industry, and 21 selected developing countries and areas.* In this way the large volume of data could be condensed into tables and the analysis streamlined.

Over 50 per cent of the approximately 1,000 questionnaires sent to firms came back, but rather more than half of these were "nil returns". This is probably in part because of the limited time-horizon and the "25 per cent clause" in the foreign direct investment definition. Completed, or at least partly completed, questionnaires were received from 233 firms, giving their views on investment for a total of 542 individual cases in 56 out of the 145 developing countries or areas. The following countries alone account for over 50 per cent of the data: Brazil (21.4 per cent), Spain (10 per cent), Mexico (5.2 per cent), Portugal (4.4 per cent), Argentina (4.2 per cent) and India (4.1 per cent). In 1979, these countries accounted for 58 per cent of aggregated direct investment in developing countries. Of the 542 projects, 59 per cent had been implemented, 16 per cent were being planned, 11 per cent had been postponed and 15 per cent had been definitely abandoned. The larger the firm, the higher the proportion of postponed and abandoned projects (40.5 per cent for firms with up to 200 employees and 35.8 per cent for firms employing 200-1,000 workers, while the overall average is 25.5 per cent).

About 40 per cent of the firms surveyed had a work-force of between 200 and 1,000 and a turnover of between DM 10 million and DM 200 million in 1978. Contrary to the frequently expressed view that there is a growing tendency in the Federal Republic for direct investment in developing countries to involve medium-sized firms, the IFO-Institute surveys paint a different picture: while over two thirds of the respondent firms in 1976 employed less than 1,000 people, 1/ in 1980 barely more than a half did so.

*This procedure is certainly not without problems from the statistical standpoint, but seems justifiable as a way of reducing the large volume of data to manageable proportions.

Of the industries in which firms had made or were considering investment in the developing countries, mechanical engineering (29 per cent of the respondents) ranked first and, if added to electrical and electronic engineering (10 per cent) and other capital goods industries (19 per cent), the capital goods industry as a whole accounted for 58 per cent of the replies. Next came textiles and clothing and the other consumer goods industries.

Reasons for direct foreign investment

The factors determining the choice of investment location are covered in section B.I of the questionnaire. The findings may be summarized as follows, according to the order in which the reasons are ranked in the questionnaire. Industrial firms in the Federal Republic of Germany invest in developing countries primarily to preserve their existing markets or to create new openings. The second most important reason is that production costs in Germany are considered too high and that competitiveness on these markets can be maintained or improved only if advantage can be taken of the lower costs of production in the developing country. The third reason is that the import policies of developing countries are becoming more and more restrictive because of their extremely tight foreign currency situation and their desire to protect domestic industry. The only effective way of countering this policy is to produce in the market. Since often, in specialized industries, a single product is involved and only one firm would need to be established in the developing country, the choice generally lies between being the first foreign establishment in the country and enjoying protection - especially from tariff barriers - or losing the market altogether in the foreseeable future. The fourth and fifth most important factors in an investment commitment are stable political conditions and a positive attitude (investment promotion policy) towards foreign investors. It is clear, however, that the sixth and eighth reasons, that is, available infrastructure (including manpower potential and upstream industry) and promotion policy in the Federal Republic, are as a rule only secondary considerations. Investment projects in which the advantage of lower production costs would be used to supply industry in the Federal Republic or to produce exports in general in the developing country (seventh reason) or which are aimed at securing raw materials (ninth reason) are all of relatively minor importance for the firms in question.

The ranking of the reasons varies according to the location. Table 1 shows the deviation from the average rating (i.e. 1) for the 21 most important locations and for the nine reasons for investment.

General obstacles and restrictions affecting direct foreign investment

The term "general obstacles and restrictions" embraces:

(a) Difficulties stemming from the world economic situation or arising within the firm itself or in the Federal Republic of Germany, that is to say, factors over which the developing countries or areas have no control;

(b) General obstacles, such as unstable social conditions or unfavourable economic conditions imposed by the general economic policy of the Governments concerned.

Table 1. Rating of the reasons for the choice of location
(deviations from the general average rating of 1)

Host country	Reasons a/							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Argentina	1.17	0.40	0.86	0.71	1.21	1.00	0.94	1.28
Brazil	1.28	0.72	0.85	0.90	0.89	0.95	1.06	1.16
Colombia	1.08	0.30	0.00	0.89	0.73	0.75	0.88	1.61
Egypt	1.06	0.74	0.61	0.77	0.35	0.93	1.25	0.90
Greece	0.89	1.23	0.13	1.20	1.21	1.00	0.78	0.64
India	0.96	0.99	1.97	1.12	0.97	0.79	0.91	1.25
Indonesia	1.08	0.89	1.71	0.71	0.97	1.31	1.31	0.90
Iran (Islamic Republic of)	1.13	0.17	0.95	0.53	0.54	0.93	0.61	0.83
Malaysia	0.58	1.74	1.71	1.48	1.69	1.12	1.09	1.12
Malta	0.06	1.76	0.39	1.68	1.43	1.27	1.19	0.49
Mexico	1.19	0.83	0.85	0.88	0.87	0.89	0.74	1.04
Nigeria	1.12	0.19	1.14	0.68	1.21	1.06	0.13	1.18
Pakistan	0.81	0.89	1.71	1.06	0.97	0.75	0.88	1.25
Portugal	0.43	1.98	1.19	1.60	1.21	0.83	1.15	0.57
Saudi Arabia	1.36	0.00	0.00	0.00	1.61	1.12	1.91	1.24
Singapore	0.59	2.34	0.61	1.57	1.51	1.14	1.50	1.07
Spain	1.11	1.08	0.77	1.06	0.93	0.93	0.67	0.96
Tunisia	0.00	2.23	0.43	1.63	1.54	1.40	1.73	0.41
Turkey	1.10	0.56	0.00	0.99	0.76	0.82	1.37	1.23
Venezuela	1.15	0.33	0.47	0.59	0.81	1.31	0.66	1.16
Yugoslavia	1.02	1.19	0.43	0.97	0.85	0.56	0.22	1.08

Note: For the method of calculation see under "Methodology".

a/ The reasons can be summarized as follows (see also text above): (1) To preserve existing markets or create new openings; (2) Because production costs are high in the Federal Republic of Germany; (3) Growing restrictiveness of import policies of developing countries; (4) Stable political conditions; (5) Positive attitude towards foreign investors; (6) Availability of infrastructure; (7) Lower production costs an advantage in supplying industry in the Federal Republic of Germany or producing exports in general in the host country; (8) Promotion policy in the Federal Republic of Germany; (9) Projects designed to secure raw materials.

The findings show that in general the world economy had little influence on the decisions taken by firms with respect to direct investment in developing countries. In over four fifths of the reported projects, it had no inhibiting effects.

Obstacles encountered within the firm or in the Federal Republic were more significant. They were mentioned in 28 per cent of the replies, and were cited in 27 per cent of the replies as a decisive factor in the postponement or definitive abandonment of investment projects. Of the firms with under 200 employees, 53 per cent referred to such obstacles, while for firms with a turnover of under DM 10 million the proportion went up to 80 per cent. The wide gap also indicates that labour-intensive firms encounter particular problems on this score.

Compared with other industrialized countries, firms in the Federal Republic apparently have more misgivings about investing (transferring assets) in developing countries and their greatest need would seem to be security. There are various reasons for this attitude, including the expropriation of German assets abroad in both world wars and, conversely, the relative ease with which foreign markets were opened up or won back because of the name for quality that German products still had after the Second World War. The result is a lack of conviction about the need to invest in developing countries or a failure to realize, yet, that there is such a need. These attitudes may become firmer or weaker, depending on the willingness of the firm's owners and management to take risks and their general initiative. Discouraging experience at first or second hand can be a deterrent. One of the in-firm difficulties is that management, naturally enough, is often divided between "risk-takers" and "security-seekers". As, in addition, it is in principle easier to demonstrate the failure of a direct investment after the event than it is to give proof of the disadvantages of not investing, the risk-takers are psychologically in a weaker position right from the start and this can lead to the abandonment of investment projects.

The interviews also revealed that even in large firms, especially where technologically complex processes are involved, it is difficult to provide the necessary expert staff to work in developing countries. For one thing, senior staff members in the larger firms are specialized, whereas project managers in the developing country have to assume all the various management functions. Employees sent abroad thus need not only their acquired expertise but other skills as well, in particular linguistic knowledge. Secondly, younger specialists are increasingly reluctant to take risks that may affect their careers. For example, they may wonder what openings there will be for them at headquarters after the period spent abroad, in particular if something has gone wrong, even though they are not personally responsible. They may also be concerned about the effects of their assignment abroad on their personal and family lives. Finally, the firms themselves do not seem to make adequate plans for the reintegration of staff returning from assignments abroad.

There were no reports of difficulties caused by union policy on job security or resulting from technological innovations. On the other hand, company spokesmen noted that Government-backed provision of additional risk capital and guarantees was insufficient or was subject to conditions and involved too much red tape. A final criticism was that though the

institutions concerned certainly provided a great deal of clear and comprehensive information about individual locations, it was not well matched to the need of investors. Firms noted that the information that was published was based to a large extent on official statistics, which did not reflect economic reality satisfactorily; a critical analysis of the situation was essential to the taking of an investment decision, and such information was rarely available.

By and large, general obstacles in the developing countries were seen by the majority of firms as less acute and less important. The restrictions and conditions imposed by the economic policies of developing countries were nevertheless said to be relatively severe (see table 2). Even so, the majority of firms considered that on the whole those difficulties were much the same as they had been in the past. Naturally enough, the firms that had postponed or finally abandoned projects considered themselves to be most severely hampered by these obstacles. They also considered the changes to be fairly negative. In addition, firms planning projects seemed inclined to take a more positive view than those already operating in developing countries and having the relevant experience. This was particularly clear in the assessment of changes in conditions and restrictions. Decisions to postpone projects were more likely to be due to factors associated with unfavourable economic conditions, while abandonment was more often put down to unstable political situations and policy restrictions and conditions.

The various industries viewed the three types of obstacles differently. Disregarding unfavourable general economic conditions, which had become typical of almost all developing countries, it was the "other capital goods" industries, mechanical engineering, food, drink and tobacco and electrical and electronic engineering which considered themselves to be particularly affected by general social policy conditions and national economic policy restrictions.

From the breakdown by size of firm, it appeared that unstable social and political conditions, as well as policy restrictions and conditions, were a fairly significant factor in the investment projects of firms with 1,000-5,000 employees, but were seen as particularly negative by those with 200-1,000 employees.

A particularly interesting pattern emerges in the assessment of the three general obstacles broken down by country. Table 3 lists the 21 most important developing countries (those mentioned at least five times), ranked on the basis of the firms' ratings. The Islamic Republic of Iran, Turkey and Colombia were rated as relatively unfavourable in terms of all three obstacles. Argentina, Venezuela, Saudi Arabia and Mexico had generally favourable ratings. Brazil, Portugal and Spain, particularly important host countries for investment by the Federal Republic of Germany, received about average ratings.

National economic policy restrictions and conditions

As explained in the previous section, industrial firms were asked to what extent, if at all, their investment projects had been hampered by economic policy restrictions and conditions in individual developing countries and areas. As the term "restrictions and conditions" covers a

Table 2. Assessment of general obstacles to foreign investment projects in developing countries or areas (deviations from the average rating of 1)

Elements involved in the project	Unstable social and political conditions		Unfavourable economic conditions		National economic policy: restrictions and conditions	
	Signifi- cance	Change vis-à-vis past significance	Signifi- cance	Change vis-à-vis past significance	Signifi- cance	Change vis-à-vis past significance
Project status:						
Implemented	0.90	0.98	0.88	0.95	0.96	0.99
Planned	0.82	0.80	0.86	0.93	0.96	0.90
Postponed	1.30	1.11	1.57	1.15	1.05	0.92
Abandoned	1.36	1.13	1.26	1.19	1.21	1.21
Industrial sector:						
Chemicals	0.58	0.84	0.44	1.03	0.96	0.95
Other basic industries	0.75	0.96	0.75	0.97	0.92	1.18
Mechanical engineering	1.06	1.11	1.05	1.02	1.02	1.04
Electrical and electronic engineering	0.93	0.96	0.92	0.95	1.04	1.04
Other capital goods industries	1.23	1.00	1.20	1.01	1.03	0.93
Textiles and clothing	0.86	0.79	0.84	0.85	1.04	0.94
Other consumer goods industries	1.05	1.00	1.17	1.02	0.89	0.97
Food, drink and tobacco	1.12	1.16	1.38	1.30	1.01	1.00
Construction etc.	1.12	0.96	1.28	0.98	1.02	--
Numbers employed by the firm concerned:						
Under 200	0.92	0.93	1.25	1.01	0.97	0.99
200-999	0.96	1.01	0.89	0.99	0.94	1.03
1,000-4,999	1.16	1.04	1.13	1.02	1.07	0.97
5,000 and over	0.88	0.95	0.92	0.99	1.00	1.00
Total average	1.00	1.00	1.00	1.00	1.00	1.00
Aggregate rating	44.60	61.10	39.00	51.30	57.50	62.60

Table 3. General obstacles to investment projects in selected developing countries, ranked by country

General obstacle	Relatively unfavourable rating		Relatively favourable rating		Average rating (± 5 per cent)	
	Signifi- cance	Change vis-à-vis past significance	Signifi- cance	Change vis-à-vis past significance	Signifi- cance	Change vis-à-vis past significance
Unstable so- cial and political conditions	Turkey Islamic Re- public of Iran Colombia Portugal Egypt Yugoslavia Nigeria Pakistan India Indonesia	Islamic Republic of Iran Turkey Colombia Malta Tunisia Pakistan India Singapore Spain	Argentina Mexico Malaysia Venezuela Greece Brazil Spain Tunisia Saudi Arabia	Portugal Egypt Greece Argentina Saudi Arabia Indonesia Nigeria Mexico Yugoslavia Venezuela	Malta Singapore Brazil Malaysia	
Unfavourable economic conditions	Egypt Islamic Re- public of Iran Nigeria Greece Malta Tunisia Turkey Portugal	Islamic Republic of Iran Colombia Venezuela Malta Spain	Venezuela Mexico Colombia Saudi Arabia Argentina India Singapore	Nigeria Argentina India Indonesia Saudi Arabia Portugal Tunisia Yugoslavia Mexico	Yugoslavia Indonesia Malaysia Pakistan Spain Brazil	Brazil Singapore Greece Egypt Malaysia Pakistan
National economic policy re- strictions and con- ditions	Turkey Indonesia Pakistan Yugoslavia Islamic Re- public of Iran Egypt Nigeria Brazil Venezuela India	Islamic Republic of Iran Colombia Turkey Greece Malaysia Singapore Nigeria Malta Indonesia Brazil	Saudi Arabia Singapore Tunisia Malaysia Argentina Spain	Argentina Egypt Tunisia Venezuela Pakistan India Portugal Mexico	Colombia Mexico Greece Malta Portugal	Spain Yugoslavia Saudi Arabia

variety of regulations and measures, it was important to find out which were felt to be most obstructive. In the questionnaire they were broken down into 17 types, as follows:

- (1) Regulations concerning local capital participation;
- (2) Financial conditions (borrowing from local banks, the ratio between equity and borrowed capital etc.);
- (3) Conditions or restrictions regarding choice of location;
- (4) Environmental policy conditions;
- (5) Conditions regarding the supply of raw materials (import restrictions, cash deposits, custom duties, use of locally produced intermediates etc.);
- (6) Employment legislation (recruitment or dismissal, social regulations, the right to strike, training obligations etc.);
- (7) Wage policy (statutory minimum wage, wage trends, social benefits);
- (8) Technical production conditions (for example, choice of process);
- (9) Production conditions (regulations specific to the product or industry, bans on competition etc.);
- (10) Conditions or restrictions affecting sale exporting requirements, sale channels etc.;
- (11) Conditions affecting price formation (minimum and maximum prices);
- (12) Taxation (tax rates, number of taxes etc.);
- (13) Regulations governing the transfer of profits;
- (14) Difficulties in dealing with State authorities (protracted licensing procedures etc.);
- (15) Uncertainty about whether legal or contractual rights will be upheld in the country;
- (16) Danger of nationalization (expropriation risk);
- (17) Other.

Respondents were asked to rate these regulations or conditions according to their significance (1 (significant); 2 (less significant); 3 (minor)) and to note any change in their significance (+ (up); = (no change); - (down)). The replies are analysed here according to: (a) project status (implemented, planned, postponed, abandoned); (b) industrial sector; (c) size of firm; and (d) country.

The most important individual factor for investors in the Federal Republic is the difficulty in dealing with the State authorities (bureaucracy) in developing countries: less than one fifth of the answers rated the problem as only a minor one. Other factors of particular importance related to capital as a factor of production and conditions regarding its ownership and return (transfer); the regulations governing local participation, financing conditions and transfer of profits rank second to fourth in the list of individual obstacles. In fifth place investors put restrictions on the supply of raw materials and intermediates (import restrictions, cash deposits, customs and compulsory use of local products both for production and plant investment). Sixth on the list were "other" obstacles, those most frequently mentioned being corruption, the risk of extortion and problems with the local partner. Obstacles connected with the prevailing system and the country's general economic and financial policy were next in line. Seventh was the uncertainty about whether legal and contractual rights would be upheld in the courts, eighth being employment legislation, recruitment and dismissal, social regulations, the right to strike, training obligations etc., ninth taxation, tenth wage policy, for example statutory minimum wage, wage trends and social benefits, eleventh the danger of nationalization, and twelfth price formation, for example minimum and maximum prices.

By and large, the remaining conditions, which can in fact be regarded as project-specific, are evidently of secondary importance. These were, in thirteenth place, sales (exporting requirements, sales channels), fourteenth location, fifteenth product regulations and bans on competition, sixteenth environmental pollution, and finally, in seventeenth place, the choice of production technology. It should be noted, however, that from the fifth place downwards the weighted majority and from tenth place the absolute majority of answers rated the restrictions and conditions as minor. In other words, for the majority of investment projects the firms saw wage policy, the danger of nationalization, pricing and exporting requirements etc. as relatively insignificant factors in their investment decisions. On the other hand, it will be seen that problems with the authorities and the treatment of foreign capital in developing countries are still critical.

The significance of restrictions and conditions remained generally unchanged, according to 82.7 per cent of the responses, ranging from 69.8 per cent for the supply of raw materials to 94.2 for choice of production technology. Where a change was noted, the move had invariably been upwards, although the extent of the change might differ from one case to another.

Respondents indicated that there had been a relatively sharp increase in the difficulties in dealing with the authorities, employment legislation provisions and measures, wage policy, the supply of raw materials and intermediates and, finally, financing. In contrast to the ratings for "significance", less important conditions, such as those concerning sales and exports and environmental pollution, took on more prominence. There had apparently been a relative improvement in certain factors, including local capital participation, financing, transfer of profits, uncertainty about legal rights and the risk of nationalization. In brief, the survey suggests that difficulties in dealing with the authorities continue to be the biggest obstacle and that the growing incidence of active employment and wage policies is an additional problem.

The rating of individual restrictions and conditions varied considerably according to whether the firm had implemented, planned, postponed or abandoned an investment project. Here the individual deviations from the average were four times as great in the "significance" ratings as in the "change" ratings, and they became increasingly negative as they moved from implemented towards abandoned projects.

As might be expected, firms with implemented, or even planned, direct investment had fewer difficulties with restrictions and conditions than those that had postponed or abandoned projects. This does not necessarily mean, however, that the former rated all individual factors more positively than the latter and that the score was the same for each individual category (see table 4). At the same time it can be seen that in the case of restrictions and conditions generally regarded as particularly important, the deviations were relatively small, which means that firms were largely in agreement when it came to the critical factors.

Implemented projects were mainly hampered by conditions governing the supply of raw materials (imports), taxation and wages policy, although in the three other project status categories only 28, 12 and 13 per cent of the firms respectively attributed great importance to them, except for wage policy conditions in the case of abandoned projects and taxation in the case of planned direct investment, and even then they were not given a high score.

In planned projects, substantial negative deviations from the average (1) were registered for product regulation and choice of production technology (1.52). The other main conditions affecting the planning level concerned choice of location, transfer of profits, price formation and taxation.

There were striking differences not only between the ranking of implemented and planned projects on the one hand and postponed and abandoned projects on the other hand but also between postponed and abandoned projects. In the two latter categories, "other" factors (such as problems with the partner and corruption), the danger of nationalization and uncertainty about legal rights and to some extent difficulties in financing and local capital participation were relatively important. There are probably two main reasons for this rating pattern. First, problems that had already been solved in the more advanced stages of implementation and planning were probably given a high rating, or there was more determination to overcome the difficulties encountered. Secondly, general restrictions such as uncertainty about rights, danger of nationalization, wage policy etc., were possibly a stop-gap answer because the respondent had forgotten the real reasons and had to give an excuse for having abandoned the investment. These impressions are supported by the fact that in the case of postponed projects - as opposed to those that had been abandoned - the more concrete conditions (such as those regarding financing and local capital participation) were given a higher rating.

The individual sectors of industry were hampered to differing degrees by the various restrictions and conditions in the developing countries (see table 5). The deviations in the "significance" ratings were considerably greater than those in the "change" ratings. For the particularly

Table 4. Ranking of negative deviations from the average rating for individual restrictions and conditions, by project status

Restrictions and conditions	Implemented projects	Planned projects	Postponed projects	Abandoned projects
Local capital participation	--	14	4	6
Financing	<u>a/</u>	13	2	<u>a/</u>
Choice of location	<u>a/</u>	5	5	5
Environmental pollution	<u>a/</u>	3	<u>a/</u>	<u>a/</u>
Supply of raw materials	1	<u>a/</u>	<u>a/</u>	12
Employment legislation	<u>a/</u>	9	<u>a/</u>	10
Wage policy	3	<u>a/</u>	<u>a/</u>	4
Choice of production technology	<u>a/</u>	2	10	11
Product regulation	<u>a/</u>	1	9	<u>a/</u>
Sales, exports	<u>a/</u>	4	8	<u>a/</u>
Price formation	<u>a/</u>	7	<u>a/</u>	7
Taxation	2	8	<u>a/</u>	<u>a/</u>
Transfer of profits	<u>a/</u>	6	<u>a/</u>	8
Dealings with the authorities	<u>a/</u>	12	7	9
Uncertainty about legal rights	<u>a/</u>	11	6	2
Danger of nationalization	<u>a/</u>	10	3	1
Other	--	--	1	3

a/ Positive deviation from the average rating.

important factors, the different sectors all took a fairly similar view, but there were considerable differences in the ratings of the following: choice of production technology, product regulation, environmental pollution, other (for example corruption and co-operation with the partner), choice of location, uncertainty about rights, sales and exports and wage policy. In the following paragraphs the sector-specific deviations in obstacles that were considered especially important are discussed and, thereafter, any marked differences in the other obstacles.

The textile and clothing industry, chemicals, other consumer goods industries and construction regarded difficulties in dealing with the authorities as a relatively serious obstacle. Other basic industries and other capital goods industries, mechanical engineering and building and construction all rated regulations concerning local capital participation and - with the exception of mechanical engineering - financing as relatively important. Other basic industries, textiles and clothing, other consumer goods and capital goods industries and construction felt hampered by restrictions on the transfer of profits, while the mechanical engineering and other capital goods industries found relatively serious problems in the conditions relating to the supply of raw materials and intermediates. Electrical and electronic engineering and the food, drink and tobacco industry rated those five main restrictions and conditions as relatively unimportant.

Furthermore, the following factors were rated as having considerable significance:

(a) Conditions relating to the choice of location for other capital goods industries and the chemical industry;

(b) Regulations concerning the control of environmental pollution for the chemical industry and for other consumer goods industries;

(c) Wage policy conditions for other capital goods industries;

(d) Conditions relating to the choice of production technology for building and construction, for other capital goods industries and for other consumer goods industries;

(e) Product regulation for building and construction, for other capital goods industries and for the chemical industry;

(f) Regulations concerning sales and exports for the other consumer goods industries;

(g) Conditions regarding price formation for the other basic industries and food, drink and tobacco;

(h) Regulations concerning the transfer of profits for other basic industries.

The most sensitive individual industries are thus shown to be chemicals and other basic industries, other capital goods industries, consumer goods industries and building and construction.

A comparison of the "significance" and "change" ratings in table 5 reveals that, generally speaking, high or low "significance" ratings correspond to low or high "change" ratings for the various restrictions and conditions. The reasons are psychological, deviations from the average in the "change" column being due to the fact that the questions about changes were more difficult to answer, so the ratings were more cautious. A comparison of the two scales in table 5 shows that in the food, drink and tobacco, electrical and electronic engineering, mechanical engineering and other basic industries, the "change" figures are higher than those for "significance". The assumption, therefore, is that the obstacles encountered in these industries had become much more serious.

As might be expected, the analysis by size of firm (see table 6) shows that the individual restrictions and conditions were given particularly high ratings by small firms (less than 200 employees), where the negative deviations were greatest for 12 of the 17 individual factors. On the whole, sensitivity to such problems tended to have different rating profiles. Thus the very important conditions regarding local capital participation, financing, the supply of raw materials and choice of location were of front-rank significance even for fairly large firms with 1,000-5,000 employees. Similarly, restrictions on the transfer of profits were also significant in this group, though medium-sized firms (200 to 1,000 employees) were the most sensitive. With regard to changes in restrictions and conditions, the negative assessment was less pronounced in the smaller firms. Surprisingly, it was mainly the large firms that reported increasing difficulties. Small firms saw themselves increasingly threatened by employment legislation and wage policies, restrictions on the choice of production technology and product programme, uncertainty about rights, nationalization and corruption etc. Large firms, on the other hand, identified a tightening of restrictions and conditions on financing, choice of location, environmental pollution, supply of raw materials, sales and exports, price formation, taxation and transfer of profits, three of those five being among the most important individual factors. The two middle-size categories deemed the changes to be relatively favourable, in particular the group with 200-1,000 employees. That group had an above-average rating only for deteriorating conditions regarding local capital participation, while firms with 1,000-5,000 employees put the growing difficulties in dealing with State authorities and financing conditions in first place. The increase in restrictions and conditions reported by large firms was probably due to tighter control over the activities of large multinationals. The increasing difficulties encountered mainly by medium-sized firms in dealing with the authorities and in local participation in capital were also to be seen in that light. Large firms seemed to be less affected by those two problems, however, as they were in a stronger negotiating position or could negotiate at a higher political level and were therefore, apart from anything else, able to get round the local capital participation rule or to prevent an outside majority holding.

As in the assessment of the three general obstacles by country, there is also an interesting pattern in the country-specific ratings of the 17 restrictions and conditions. Table 7 gives the ranking of the 21 most important developing countries (those mentioned at least five times) on the basis of firms' ratings of each of the seven most important individual

factors. If the "significance" ratings of the individual factors are aggregated, Turkey comes first, followed by Yugoslavia, Egypt, Nigeria, Pakistan, India, Venezuela, Islamic Republic of Iran, Brazil and Greece, in that order. Ratings showed little or no difficulty with investment policy measures in Argentina, Malaysia, Malta, Mexico, Saudi Arabia, Singapore, Spain and Tunisia, or even in Colombia, Indonesia or Portugal. Of the countries rated as relatively unfavourable, the only ones where conditions seemed to have deteriorated were the Islamic Republic of Iran, Turkey and Venezuela and, to some extent, Brazil. In the group of countries rated as relatively favourable, an increase in restrictions and conditions was reported mainly in Colombia, but also in traditionally favourable countries such as Mexico and Singapore. On the other hand, firms' ratings indicated improvements in Egypt, Greece, India, Nigeria, Yugoslavia and also in Argentina, Indonesia, Pakistan and Portugal.

Dealing with the authorities is obviously particularly difficult in countries with unstable political conditions. In addition, negotiations were reported to be complicated even in countries with a relatively well-trained class of civil servants. Geographically, large countries predominated in this group. Regulations concerning local capital participation hampered investment projects mainly in the oil-producing countries. In the case of conditions regarding financing, transfer of profits and the supply of raw materials, no such characteristics and no significant continent-specific features can be determined. Employment legislation and wage policy, on the other hand, were regarded as serious obstacles in the Mediterranean countries. The reasons are probably to be sought in the migratory movements of the labour force and contact with unions in the industrialized countries of Europe. Although, on the average, these factors were rated only eighth and tenth in terms of significance, the change in them was judged to be particularly unfavourable, and was rated second and third.

The assessments for the remaining 10 less important restrictions and conditions are summarized in table 8.

Selected restrictions and conditions identified in interviews with firms

In addition to determining the process by which firms reached investment decisions, the purpose of the interviews carried out after the questionnaires had been returned was mainly to clarify the specific relationships and difficulties that lay behind the 17 types of restrictions and conditions named in the questionnaire and which of them were, or had been, really critical issues. The results merely supplement and clarify the ratings given in the questionnaire, which were interpreted as being representative. The problems cannot therefore be considered to be general, even though the analysis concentrates on obstacles that were mentioned several times.

In most cases - with the exception of export-oriented investment projects - an export phase preceded the investment phase. As a rule, firms' initial contacts with developing countries were made at domestic and foreign trade exhibitions and fairs, through export trading companies and, especially in the case of large firms, through their own market research. Semi-public investment promotion and information agencies played a secondary role in the first phase, in which contact was established. The firms interviewed had, in fact, already had business relations with

Table 5. Rating of individual restrictions and conditions imposed by the national economic policies of developing countries, by industry (deviations from the average rating of 1)

Restrictions and conditions	Electrical and engineering									
	Chemical industry	Other basic industries	Mechanical engineering	Electrical and electronic engineering	Other capital goods and industries	Textiles and clothing	Other consumer goods and industries	Food, drink and tobacco	Building and construction	
Local capital participation	(a) 1.01 (b) 2.04	1.19 1.14	1.10 1.06	0.75 0.95	1.13 0.91	0.73 0.92	0.85 0.96	0.87 1.03	1.04 1.03	
Financing	(a) 1.00 (b) 1.03	0.46 0.90	1.09 1.07	0.89 1.03	1.08 0.87	0.85 0.89	1.00 1.01	0.94 1.16	1.03 0.92	
Choice of location	(a) 1.43 (b) 1.12	0.21 0.96	0.73 1.02	1.18 1.04	1.54 0.92	0.97 1.05	1.15 0.96	0.59 0.79	0.00 0.26	
Environmental pollution	(a) 2.06 (b) 1.11	0.80 1.04	0.81 1.04	0.37 0.96	1.07 0.95	0.68 0.98	1.55 0.96	0.00 0.85	1.30 0.93	
Supply of raw materials	(a) 0.99 (b) 1.05	0.93 1.14	1.10 1.03	0.99 1.12	1.04 0.90	0.86 0.93	0.90 0.94	0.59 0.94	0.96 0.85	
Employment legislation	(a) 0.90 (b) 1.00	0.71 1.22	1.00 0.98	0.99 1.04	1.21 1.03	1.08 0.97	0.89 0.91	0.72 0.91	1.17 0.90	
Wage policy	(a) 0.36 (b) 0.91	0.79 1.24	0.97 1.06	0.87 0.94	1.38 0.97	1.21 1.00	1.11 0.93	1.27 1.10	0.92 0.92	
Choice of production technology	(a) 0.27 (b) 1.01	0.88 1.15	0.68 0.96	0.39 1.01	2.16 1.02	1.25 0.98	1.38 1.01	0.42 0.98	3.13 0.98	
Product regulation	(a) 1.35 (b) 1.07	0.23 0.97	0.87 0.99	0.51 0.97	1.46 1.01	0.82 0.97	1.27 1.02	0.33 0.97	2.45 0.97	
Sales, exports	(a) 1.12 (b) 1.03	0.97 1.18	0.84 0.99	0.73 0.99	1.25 0.98	1.18 0.99	1.44 1.00	0.39 0.91	0.59 0.91	
Price formation	(a) 1.38 (b) 1.05	2.02 1.18	0.70 1.00	0.67 1.04	1.28 0.91	0.75 0.91	1.06 1.00	1.35 1.09	1.15 0.91	

Taxation	(a)	1.01	1.26	0.79	1.02	1.19	1.15	1.22	0.38	1.25
	(b)	1.01	1.18	1.00	1.09	0.89	1.04	0.95	0.91	1.08
Transfer of profits	(a)	0.66	1.38	0.99	0.76	1.10	1.23	1.14	0.95	1.04
	(b)	0.93	1.24	1.05	1.03	0.98	1.05	0.93	1.02	1.01
Difficulty in dealing with authorities	(a)	1.02	1.00	0.99	0.98	0.96	1.09	1.02	0.85	1.01
	(b)	1.00	0.96	1.06	1.09	0.93	0.82	0.97	1.04	1.04
Uncertainty about legal rights	(a)	0.63	1.25	0.92	0.88	1.23	1.28	0.90	1.00	1.69
	(b)	0.95	1.06	1.00	1.01	0.97	1.02	0.96	1.15	1.15
Danger of nationalization	(a)	1.09	1.11	0.79	0.78	1.25	1.33	1.11	1.11	0.86
	(b)	1.02	0.95	1.02	0.95	0.99	0.99	0.97	1.12	1.04
Other	(a)	0.00	1.29	0.89	1.84	1.17	1.14	1.11	0.00	1.29
	(b)	0.00	1.32	1.04	0.88	1.07	1.00	0.94	0.88	1.10

Notes: The relative deviations are based on an aggregate rating of the three categories described under "Methodology" above. Scale (a) denotes "significance"; scale (b) denotes "change".

Table 6. Rating of individual national economic policy restrictions and conditions in developing countries according to size of firm (deviations from the average rating of 1)

Restrictions and conditions	Under 200 employees		200-999 employees		1,000 to 4,999 employees		5,000 employees and over	
	Significance	Change	Significance	Change	Significance	Change	Significance	Change
Local capital participation	0.97	0.94	0.96	1.05	1.12	0.95	0.91	1.01
Financing	1.09	1.00	0.90	0.98	1.11	1.01	0.95	1.01
Choice of location	1.05	0.92	0.91	0.96	1.12	1.01	0.96	1.05
Environmental pollution	1.41	1.01	1.37	1.00	0.79	0.98	0.63	1.02
Supply of raw materials	0.81	1.02	0.88	0.96	1.12	1.00	1.06	1.03
Employment legislation	1.11	1.16	1.01	0.95	0.93	1.00	1.02	1.02
Wages policy	1.51	1.23	1.16	1.00	0.99	0.98	0.64	0.95
Choice of production technology	1.85	1.14	1.29	0.96	0.54	0.96	0.90	1.05
Product regulation	1.97	1.08	1.00	0.99	0.90	0.98	0.79	1.01
Sales, exports	1.26	0.98	0.80	0.97	0.99	1.00	1.18	1.04
Price formation	1.39	1.01	0.83	0.97	0.88	1.00	1.24	1.03
Taxation	1.41	1.09	0.99	0.89	0.98	1.03	0.92	1.06
Transfer of profits	0.98	1.00	1.08	0.97	1.07	0.98	0.83	1.06
Difficulties in dealing with the authorities	1.15	1.02	1.02	0.97	0.83	1.04	1.00	0.99
Uncertainty about legal rights	1.41	1.12	1.15	0.98	0.83	0.99	0.85	0.99
Danger of nationalization	1.45	1.16	1.04	0.96	0.91	1.01	0.90	0.99
Other	1.47	1.02	1.07	0.99	0.76	1.01	1.06	0.99

Note: The relative deviations are based on an aggregate rating of the three categories described under "Methodology" alone.

Table 7. Most important economic policy restrictions and conditions affecting direct foreign investment in developing countries ranked by country

Most important restrictions and conditions	Relatively unfavourable rating		Relatively favourable rating		Average rating (± 5 per cent)	
	Signifi- cance	Change vis-à-vis past significance	Signifi- cance	Change vis-à-vis past significance	Signifi- cance	Change vis-à-vis past significance
Difficulty in dealing with authorities	Turkey	Islamic Republic	Singapore	Tunisia	Indonesia	India
	Pakistan	of Iran	Spain	Egypt	Portugal	Indonesia
	Yugoslavia	Turkey	Tunisia	Singapore	Greece	Portugal
	Venezuela	Pakistan	Mexico	Malaysia	Malta	
	Nigeria	Nigeria	Malaysia	Greece		
	Egypt	Colombia	Saudi Arabia	Argentina		
	India	Saudi Arabia		Spain		
	Colombia	Brazil		Mexico		
	Islamic Re-	Yugoslavia		Malta		
	public of Iran			Venezuela		
	Brazil					
	Argentina					
Local capital participation	Nigeria	Islamic Republic	Argentina	Malta		Colombia
	Pakistan	of Iran	Singapore	Spain		Tunisia
	Islamic	Turkey	Malta	Argentina		Brazil
	Republic	Nigeria	Tunisia	Portugal		Yugoslavia
	of Iran	Indonesia	Portugal	Greece		
	Mexico	Malaysia				
	Saudi Arabia	Singapore		Egypt		
	Indonesia	Mexico	Colombia	Saudi Arabia		
	Venezuela	Venezuela	Spain	Pakistan		
	India		Brazil	India		
	Malaysia					
	Egypt					
	Turkey					
	Yugoslavia					

continued

Table 7 (continued)

Most important restrictions and conditions	Relatively unfavourable rating		Relatively favourable rating		Average rating (± 5 per cent)	
	Signifi- cance	Change vis-à-vis past significance	Signifi- cance	Change vis-à-vis past significance	Signifi- cance	Change vis-à-vis past significance
Financing	Pakistan	Islamic Republic of Iran Turkey Venezuela Colombia Pakistan Brazil	Singapore	Malta	India	Indonesia
	Egypt		Saudi Arabia	Argentina	Spain	Greece
	Colombia		Argentina	Singapore	Malaysia	Malaysia
	Venezuela		Malta	Portugal		Mexico
	Greece		Portugal	Egypt		Tunisia
	Nigeria		Tunisia	Nigeria		Spain
	Turkey		Islamic Re- public of Iran	India		
	Yugoslavia		public of Iran	Yugoslavia		
	Brazil		Mexico			
	Indonesia					
Transfer of profits	Turkey	Islamic Republic of Iran Turkey Colombia Portugal Tunisia Venezuela	Singapore	Indonesia		Brazil
	Yugoslavia		Saudi Arabia	Argentina		Yugoslavia
	India		Indonesia	Singapore		Greece
	Islamic Re- public of Iran		Malta	Malta		Nigeria
	Tunisia		Venezuela	Spain		
	Brazil		Mexico	Saudi Arabia		
	Pakistan		Malaysia	Mexico		
	Nigeria		Colombia	Malaysia		
	Portugal		Spain	Egypt		
	Greece		Argentina	Pakistan		
			Egypt	India		

Supply of raw materials	Turkey India Venezuela Brazil Nigeria Colombia Egypt Indonesia Argentina	Islamic Republic of Iran Colombia Yugoslavia Turkey Brazil Mexico Greece Venezuela	Singapore Saudi Arabia Malta Pakistan Islamic Republic of Iran Tunisia Malaysia Spain Greece Portugal Mexico Yugoslavia	Indonesia Singapore Malta Tunisia Saudi Arabia Pakistan Malaysia Portugal Egypt Spain Nigeria Argentina	India
Employment legislation	Turkey Malta Spain Portugal Yugoslavia Saudi Arabia Greece Egypt	Islamic Republic of Iran Turkey Pakistan Singapore Spain Venezuela	Indonesia Colombia Singapore Argentina Pakistan Nigeria Brazil Mexico Venezuela Malaysia India	Tunisia Indonesia Egypt Argentina India Mexico	Nigeria Malta Malaysia Yugoslavia Saudi Arabia Brazil Colombia Greece Portugal
Wage policy	Turkey Malta Portugal Tunisia Spain Yugoslavia Malaysia Islamic Re- public of Iran Greece	Turkey Islamic Republic of Iran Spain Yugoslavia Malta	Saudi Arabia Pakistan Singapore Indonesia Mexico Egypt Argentina Nigeria India Colombia	Indonesia Saudi Arabia Pakistan Egypt Argentina Malaysia	Portugal Colombia Nigeria Greece Singapore Brazil India Tunisia Venezuela Mexico

Table 8. Assessment of less important restrictions and conditions affecting direct foreign investment in developing countries, ranked by country

Assessment	Ranking of countries	
	Significance	Change
Relatively unfavourable	India	Islamic Republic of Iran
	Colombia	Nigeria
	Egypt	Colombia
	Nigeria	Turkey
	Venezuela	India
	Portugal	Pakistan
	Yugoslavia	Yugoslavia
	Greece	Venezuela <u>a/</u>
	Turkey	Mexico <u>a/</u>
	Islamic Republic of Iran	
	Indonesia <u>a/</u>	
Relatively favourable	Malaysia <u>a/</u>	
	Spain	Argentina
	Argentina	Portugal
	Mexico	Egypt
	Singapore	Saudi Arabia
	Tunisia	Singapore
	Saudi Arabia	Tunisia
	Malta	Spain
	Brazil	Malaysia
	Pakistan <u>a/</u>	Malta
		Brazil
		Indonesia <u>a/</u>
		Greece <u>a/</u>

a/ About average rating (± 5 per cent).

developing countries for a fairly long time. As a rule - and in particular in the capital goods industries, which accounted for half the respondents - there were four stages in those relations. In the first, trading firms would co-operate with the developing country in the matter of exports. Secondly, a service and repair centre would be established, largely with a view to promoting exports, either as an independent concern or as part of an existing marketing company. Thirdly, for reasons of competitiveness (to reduce costs) or because of prospective export difficulties (for example the procurement of import licences in the developing country), there would be a transition to increased manufacture of parts in an independent firm or to the granting of licences and transfer of other know-how to existing local firms, possibly with limited capital participation. Lastly, with the increasing foreign competition on the developing country market, import substitution policy by the country concerned, high rates of inflation and heavy fluctuations in exchange rates, there would be a transition to greater direct investment, with or without a local partner.

The individual conditions and restrictions concerned the fourth stage and, to some extent, the third stage. By and large, firms would make the transition to the third and fourth stages only if, in addition to economic considerations, the developing country operated an increasingly effective import substitution policy.

The interviews revealed that entrepreneurial co-operation negotiated the four stages in different ways. The capital goods industries, in particular the medium-sized firms, moved systematically from the first to the fourth stage. The branches already traditionally represented in the developing countries (textiles and clothing, other consumer goods industries and food, drink and tobacco) usually began with the third stage. Large firms and the chemical and construction industries, often made a direct switch from exports (first stage) to relatively substantial direct investment (fourth stage), while direct entry to the fourth stage was typical of export-oriented industries.

Firms that had gone through all or most of the stages and had the longest association with the country concerned might be expected to respond to restrictions and conditions more easily and more flexibly but the questionnaire and interviews did not bear out that expectation.*

It could possibly be argued that restrictive measures hit foreign investors too suddenly and required rapid adjustment measures that just could not be put through in a short period. The interviews revealed that the conditions relating to the use of locally manufactured intermediates and machinery were felt to cause particular difficulty, especially in the capital goods industry as a whole (see table 5).

The branch-specific "local content problem" appeared mainly in Latin America, but also in southern European countries and in India, Nigeria and Turkey. In high-technology products, the problem was mainly one of qual-

*The capital goods industry as a whole was the only one to have relatively little difficulty in dealing with the authorities (see table 5).

ity. As the local supplier often held a monopoly and demanded correspondingly high prices, a profitability problem arose if the supplies from abroad were cheaper and the final product was not sufficiently protected (Argentina), or if the investor had to compete on the world market because of export levies. The former case was of greater importance when the borders were open and cheap products flooded the market (Venezuela); countries where export quotas applied included Brazil, Mexico, Turkey and Yugoslavia.

Conditions governing the procurement of raw materials and intermediates also played an important role in the case of import restrictions (import quotas, customs duties, cash deposits and price controls) for goods that were not yet subject to the "local content" clause.

Import quotas constituted a "soft" pressure on the firm to look for local supplies or to co-operate in developing them. The pressure was felt all the more strongly if the quotas were frozen for a period of years and the firms wanted to expand (Yugoslavia, Turkey). High customs duties on intermediates were seen as relatively less significant, as they would probably be compensated for by customs protection for the final product, and in order to protect its industry the developing country tended to moderate the relevant rates of duty. On the other hand, cash-deposit conditions presented a problem, in particular when the country concerned had a high rate of inflation and when there were also financing difficulties; medium-sized firms were particularly affected. For the pharmaceutical industry, price controls on the import of "patented intermediates" from the parent firm were a particular difficulty in Latin America.

Regulations governing local capital participation in investment projects were rated variously in the interviews. By and large, industry in the Federal Republic showed a preference for 100 per cent ownership of the new establishment, or at least for a majority holding. A minority holding became progressively more acceptable:

(a) With a lesser need to protect technological processes and know-how against competition - in other words, if there was a definite technological monopoly, and even extensive patent protection of the production process, the firm would insist on a majority holding at least, as otherwise protection could not be regarded as secure;

(b) With a financially sounder and stronger local partner.

A number of firms had postponed or abandoned projects because they could not find a reliable partner or had been let down. Thus it was reported that local partners used various conditions to further their own interests, or even allegedly invented such conditions, thus destroying the trust between partners right from the start. In another case, when the joint venture was wound up, the firm's share of the capital (in deutsche marks) was almost completely worthless because of inflation and because there had been too little, if any, change in the exchange rates.

The partner's financial strength is a particularly important factor when the market encourages the joint venture to expand production, but expansion is hindered if the partner is not able to pull his weight because of a lack of capital and if the investing firm's hands are tied because of

its legally imposed minority holding. This restricts the growth of production desired by the developing country. One way out would be to secure the financial participation of a local development bank, but from the interviews it would seem that firms preferred not to do so, in order to avoid being hemmed in by complicated procedures and co-decision rules (Latin America, Malaysia) and because they were afraid that development banks, which generally only planned for the medium term, might sell their share to an unacceptable third party. A large local firm, or even a foreign competitor, could thus buy directly or indirectly into the joint ventures between banks in the Federal Republic and in developing countries through joint holding companies, which would not participate in management. Participation by the bank in running the business or the bank's exercise of a controlling function, both seemingly prevalent in some developing countries, was considered undesirable. For example, it was reported that an investing firm had a partner "imposed" on it in the form of a State holding bank, whose representatives changed frequently, so that the relationship between the partners was considerably impaired. In particular, the advantage of having a local partner who could help to solve administrative and bureaucratic problems was to a large extent lost.

A number of firms saw certain provisions laid down by the Andean Common Market (Commission of the Cartagena Agreement) in Latin America as restrictive in stipulating that the Common Market of the Andean Pact countries is open only to firms with foreign investment in which there is a local majority capital holding. As a supplementary measure, it is laid down that the countries should agree on regional specialization to take advantage of the economies of scale associated with relatively large production capacities. Those regulations, which guaranteed the foreign investor a larger market in return for accepting a minority holding, had apparently not worked out in practice. First, there was no suitable infrastructure for inter-State trade between the Andean countries and, secondly, individual Governments had not honoured their agreement on the distribution of industries. The result was uncertainty in estimating markets and corresponding problems in making investment decisions and planning capacity. On the one hand, large projects had been hindered; on the other hand, over-large capacities or non-viable firms had been established. Thus, the quid pro quo for accepting a minority holding had not materialized. Furthermore, demand for goods produced in Latin America was relatively small compared with that for competing products from the industrialized countries, so that it was only possible to produce in relatively small plants for national markets, where prices were often unfavourable owing to price controls.

Some large firms, which had so far invested in developing countries only through fully-owned subsidiaries or majority holdings, stated that they would be able to accept a minority holding only if comprehensive protection of the minority partner were guaranteed. That guarantee would have to ensure that all-important questions, such as changes in the articles of association, the use of profits (including reserves and provisions), operational plans, investment decisions, long-term contractual relations (technology licences), the occupation of the top two levels of management, inspection rights, such as the appointment of auditors etc. would be decided jointly and that the minority partner would have the right of veto. The reason for stipulating full protection of the minority partner was probably that the developing country insisted on the foreign

partner, which it saw as economically and technologically stronger on the international level than itself, taking a greater share of entrepreneurial responsibility than was warranted by its capital holding. The investor, on the other hand, considered himself able to accept responsibility only for such decisions as he himself took or at least had an influential say in.

In some countries, such as Brazil, foreign investors were granted various privileges (under the law of investment promotion) if, among other things, they accepted a minority holding. In the field of finance, the advantages included privileged access to domestic loans and interest subsidies. Large firms, which were less in need of such financial advantages because they had enough capital of their own and readier access to foreign credit facilities, thus found it easier to refuse a minority holding than did medium-sized investors. For that and other reasons, the latter were particularly affected by regulations governing local capital participation. Some medium-sized firms reported having abandoned investment projects for that reason.

In certain countries, further financial restrictions had become significant problems for firms that had already invested. It was reported that in Colombia financing through local banks was limited even with high interest rates,* and even borrowing abroad was limited. Increases in capital - except for relatively small additions - had to be authorized, and the firms had to contend with virtually impossible export requirements. In Turkey, even reinvestment had to have official authorization, and increases in basic capital were dealt with at as high a level as the Council of Ministers. Since firms tended to avoid complicated approval procedures as much as possible and since, in addition, the original capital was often completely used up by inflation, capital cover was frequently very low and reinvestment or expansion investment was either postponed or non-existent. Transfer restrictions on licences and profits completed the picture in many countries.

The conditions and restrictions discussed so far are for the most part closely associated with difficulties in dealing with State authorities. It is quite clear that this problem, which the firms affected considered the most important individual factor, is mainly a matter of lack of confidence, failure of communication and inability to understand the position and interests of the other party, or - more broadly defined - the psychological difficulties of co-operation between partners who are often of different nationalities. 1/ It should be added, however, that foreign investors are confronted by two conflicting modes of behaviour in the developing countries. On the one hand, the developing countries endeavour to attract foreign direct investment by means of publicity campaigns and promises, while on the other hand they impose restrictions and conditions on the investor. Hopes and expectations are thus aroused in the investor, which are later not fulfilled or are overtaken by harsher reality. This can lead to a negative assessment of the situation and can shake the

*At government-controlled interest rates tied to the official rate of inflation, it is very difficult for foreign investors to obtain adequate credit facilities.

investor's confidence. The uneasy situation is aggravated if the investor does not have enough information, if he has only limited experience abroad, or if the restrictions do not affect him until he has already invested in the project and it is too late to withdraw. As a rule, firms are able to adjust to an extraordinary variety of circumstances in developing countries provided that the difficulties are known and clearly defined, so that they can be allowed for in the investment decision. Dealings with the authorities are thus particularly problematical in that they are often unpredictable and it is therefore necessary to improvise and to work with methods that may be common enough but are sometimes on the fringe of the law. When questioned on this point, the firms stated that their preliminary negotiations with the upper levels of authority usually went very smoothly and that problems only began to appear when they had to seek approval at a lower level. One of the main reasons for this was a lack of consistency in decisions taken at different hierarchical levels and the power that such a system put into the hands of lower-placed officials. When the "rich" entrepreneur needed a signature from the "badly paid" and often not very competent official, the response could be outright refusal, a shifting of responsibility, complicated negotiations and corresponding delays. The Latin American countries (particularly Colombia and Venezuela but also Brazil and others), India, Pakistan and Turkey were named fairly frequently. Quite apart from the approvals necessary for the establishment of a project, which often took from two to three years, with the intervention of many different authorities, the most significant bottle-necks occurred with procedures that were of a more or less constant nature, in particular, applications to import the intermediates necessary for production for which prices were controlled and had to be discussed, to raise prices to match the inflation rate (Latin America), and to employ experts from the Federal Republic (Malta among others).

While in the case of imports one of the main problems was the time factor, there was also an additional problem with price adjustments, which, once they were approved, turned out to be too small; as a rule they were based on the official rate of inflation, which rarely corresponded to real price trends on individual markets. Regarding the employment of outside experts, it was reported that in Malta applications to employ skilled workers and even management from the Federal Republic had to be made or renewed every year (as opposed to every three years in the past). In addition, for each skilled worker employed from the Federal Republic one Maltese had to be recruited and trained by him, and the success of that training (assessed by a three-monthly examination) determined how long the overseas worker was allowed to stay. Such conditions created uncertainty not only for the firm with respect to its staffing arrangements, especially in view of the difficulty of recruiting overseas staff, but also for the overseas workers themselves.

As a rule, an establishment agreement is signed with the authorities for each project in a developing country. The degree of detail in these agreements varies considerably. In particular, if the Government concerned agrees to provide certain services and subsidies, the firm's obligations are also laid down. It was reported that in Malta, in order to have the right to erect factory buildings on favourable terms, investors had to agree to a precise plan, with a fixed timetable for phased enlargement of capacity. When, in one case, it was impossible to obtain the agreed number of employees, a dispute developed because the authorities were not flexible enough and could not see the firm's point of view.

In Turkey, article 1 of Law No. 622/1934 on the promotion of industrial investment states that the "economic benefit to the country" has to be proved. It would generally be assumed that this question has to be settled only once, namely, when the firm is established, but the authorities reserve the right to test for "benefit" at regular intervals. This leads to uncertainty about legal rights, in particular when middle-level officials are responsible for the examination. As in Malta, manufacturing capacity is laid down and products specified in the establishment agreement. Logically, since the market is subject to change, the corresponding conditions would have to be flexible. Since any application for a change in the agreement - quite apart from the time involved - could lead to other restrictions, such as capital participation and export quotas, being raised as well, new negotiations were avoided in the cases reported. In addition, the interviews also showed that the Turkish authorities did not always honour their obligations under the agreement, and that they afterwards, to some extent, introduced additional conditions, such as export requirements, that were virtually impossible to meet.

From these examples it is obvious that firms view the authorities' failure to appreciate general economic and entrepreneurial problems as an avoidable important obstacle. It should be repeated that, although the problems are real ones, they are gleaned from individual statements, which cannot claim to be representative.

Prospects for direct investment in developing countries

Firms were also asked in the questionnaire how the share of the firm's total investment (domestic and foreign) devoted to developing countries was likely to develop over the next five years and which individual developing countries were likely to become more, or less, attractive for investment.

The answers to the first question painted a negative picture: 43.6 per cent of the firms intended to reduce the share of developing countries in their investments over the next five years, 30.7 per cent expected it to remain the same and only 25.7 per cent intended to increase it.

This does not mean, however, that direct investment by the Federal Republic in developing countries will necessarily fall in absolute terms. There are two reasons for this. First, according to IFO-Institute surveys and estimates, total investment by industries in the Federal Republic is expected to increase slightly over the next five years. Secondly, firms employing at least 5,000 workers are expected to invest relatively more in the developing countries over this period (34 per cent reported that their investment would increase, while only 16 per cent intended to decrease their investment).

As large firms are likely to account for a greater share of investment in proportion to their representation in the survey (19 per cent), even a relative increase in the share devoted to developing countries is not out of the question, provided that the planned growth in this group outweighs the decrease in the other size categories. Basically, the survey does not permit any statement about the volume of future direct investment in developing countries by firms in the Federal Republic because, for the reasons given, the firms were not asked any questions about the actual level of investment.

Table 9. Share of firms' total (domestic and foreign) investment allotted to developing countries over the next five years, by branch of industry

Branch	Increasing share			Share unchanged			Decreasing share			Total	
	Number of firms	Percentage a/	Percentage b/	Number of firms	Percentage a/	Percentage b/	Number of firms	Percentage a/	Percentage b/	Number of firms	Percentage b/
Chemical industry	5	9.6	35.7	4	6.5	28.6	5	5.7	35.7	14	6.9
Other resource-based industry	2	3.8	18.2	2	3.2	18.2	7	8.0	63.6	11	5.4
Heavy equipment	12	23.1	20.0	22	35.5	36.7	26	29.5	43.3	60	29.7
Electrical equipment	9	17.3	42.9	5	8.1	23.8	7	8.0	33.3	21	10.4
Other capital goods	11	21.2	29.7	15	24.2	40.5	11	12.5	29.7	37	18.3
Textiles and clothing	5	9.6	25.0	8	12.9	40.0	7	8.0	35.0	20	9.9
Other consumer goods	6	11.5	24.0	6	9.7	24.0	13	14.8	52.0	25	12.4
Foods and beverages	0	0	0	0	0	0	8	9.1	100.0	8	4.0
Construction and other industries	2	3.8	33.3	0	0	0	4	4.5	66.7	6	3.0
Total	52	100.0	25.7	62	100.0	30.7	88	100.0	43.6	202	100.0

a/ Vertical distribution.

b/ Horizontal distribution.

If replies are broken down by size of firm, the large firms are seen to have plans to increase the developing countries' share of total investment and those with 1,000-5,000 employees to reduce it sharply; the negative balance (excess of the number of firms reducing the developing countries' share over the number of firms increasing that share) amounts to almost 30 per cent of the firms that responded to the questionnaire. This balance falls to 20 per cent and 9 per cent respectively in the two smaller categories of size.

The branch-specific pattern of replies regarding the developing countries' future share of investment shows wide deviations from the average (see table 9). Electrical and electronics engineering is the only sector in which reports of future increases were greater in absolute terms. In chemicals and other capital goods industries, expected increases and decreases cancelled each other out, while in all other sectors negative expectations predominated. All eight respondent firms in the food, drink and tobacco industry intended to reduce their share; in other basic industries, mechanical engineering, other consumer goods and construction, at least twice as many firms intended to decrease the share as intended to increase it. There was a fairly firm flat trend in other capital goods, textiles and clothing and mechanical engineering.

Answers to the question regarding the likelihood of developing countries becoming more or less attractive for investors, countries and areas were classified in four ways, indicating those for which assessments were: (a) positive only; (b) predominantly positive; (c) negative only; and (d) predominantly negative. The ratings are set out in tabular form below.

Countries or areas showing increasing attraction for investors

<u>Positive assessments only a/</u>		<u>Predominantly positive assessments b/ c/</u>	
Indonesia	(106)	Singapore	(190)
Malaysia	(100)	Mexico	(180)
Philippines	(69)	Argentina	(140)
Ivory Coast	(20)	Brazil	(140)
Chile	(20)	Egypt	(91)
Morocco	(20)	Portugal	(81)
Iraq	(20)	Venezuela	(71)
Kenya	(19)	Nigeria	(60)
Thailand	(18)	Hong Kong	(50)
Cameroon	(11)	Greece	(40)
Algeria	(10)	India	(34)
Senegal	(10)	Republic of Korea	(30)
Sierra Leone	(10)	Taiwan Province of China	(30)
Ecuador	(10)	Yugoslavia	(20)
Colombia	(10)	Spain	(19)
Kuwait	(10)		
Pakistan	(10)		
Sri Lanka	(10)		
Total: 18 countries	(483)	Total: 15 countries	(1,095)

Countries or areas showing decreasing attraction for investors

Negative assessments only a/ Predominantly negative assessments c/ d/

Islamic Republic of Iran	(230)	Turkey	(80)
Ghana	(30)		
Libyan Arab Jamahiriya	(21)		
Malta	(20)		
Saudi Arabia	(20)		
Zimbabwe	(10)		
Sudan	(10)		
Zaire	(10)		
Central African Republic	(10)		
El Salvador	(10)		
Guatemala	(10)		
Bolivia	(10)		
Israel	(10)		
Syrian Arab Republic	(10)		
Viet Nam	(10)		
Other Asian countries or areas	(10)		
Total: 16 countries or areas	(431)	Total: 1 country	(80)

a/ Number of reports shown in parentheses.

b/ Balance of positive over negative assessments shown in parentheses.

c/ For Tunisia, the reports of increased and decreased attractiveness (10 each) cancel each other out.

d/ Balance of negative over positive assessments shown in parentheses.

The ranking of countries or areas according to their attractiveness for direct investment reveals that firms in the Federal Republic are showing an ever greater preference for traditional locations. Nevertheless, six of the 16 traditionally important locations are missing from the list of the 16 most attractive countries and areas, as shown below:

Ranking according to total direct
investment by the Federal Republic
in 1979 a/

Brazil
Spain
Mexico
Argentina
Israel
Islamic Republic of Iran
Portugal
Libyan Arab Jamahiriya
Greece
Algeria
Nigeria
Singapore
Egypt
India
Liberia
Hong Kong

Ranking according to their
assessment as locations
for future investment

Mexico
Argentina
Brazil
Singapore
Indonesia
Malaysia
Egypt
Portugal
Venezuela
Philippines
Nigeria
Hong Kong
Greece
India
Republic of Korea
Taiwan Province of China

a/ Excluding the Netherlands Antilles, Canary Islands and Panama, where special circumstances prevailed that are not discussed here.

Spain, Israel, the Islamic Republic of Iran, the Libyan Arab Jamahiriya and Liberia (and also Algeria*) will tend to decrease in attractiveness, while Indonesia, Malaysia, Venezuela, the Philippines, the Republic of Korea and Taiwan Province of China will be of particular interest to investors in the future. Changes in positions within the two rankings reveal further shifts of interest.

Summary and conclusions

The findings of the survey on direct investment by firms from the Federal Republic of Germany in developing countries and areas are based on 233 completed questionnaires, containing individual data on 440 investment projects.

The most important reasons for investing in the countries and areas concerned are the importance of the market outlet, lower costs of production and import substitution and investment promotion policies in the various locations. While the size of the market and import substitution policies attract investors mainly to Latin American countries, low costs of production offer locational advantages in the Far East and in Mediterranean countries in particular.

*In Algeria there are special political influences involved, which will not be discussed further here.

The short-term world economic situation has only a slight effect on firms' commitments in developing countries and areas, as these commitments are a matter of long-term planning. Of greater importance are obstacles within the firm itself or in the Federal Republic. Over a quarter (27 per cent) of the reports designate these problems as decisive factors in the postponement or definitive abandonment of a planned project; in some sectors the percentage is even substantially higher.

Unstable socio-political and unfavourable economic conditions and national economic policy restrictions and conditions on the whole do not constitute overwhelming obstacles, according to the firms questioned; the majority of reports classify these as relatively serious; for the majority of firms that have abandoned projects they are even of great importance. On balance, firms also see a certain increase in the social and political instability and regulatory policies of the developing countries. The particularly important - in terms of volume of investment - capital goods industry is one that feels itself particularly hampered. In this connection, the Islamic Republic of Iran, Turkey and Colombia stand out as being particularly unfavourable, while Argentina, Venezuela, Saudi Arabia and Mexico are judged to be particularly favourable. Though Brazil, Spain and Portugal are traditionally preferred countries, they are given only an average rating.

Of the 17 individual types of restrictions and conditions listed in the questionnaire, those rated as particularly bothersome are: difficulty in dealing with the authorities, regulations governing local capital participation, financing conditions, control of the transfer of profits and conditions governing the procurement of raw materials and intermediates. On the whole, the significance of restrictions and conditions has remained much the same as before (83 per cent of the reports), though there are certain deviations from this average in the case of individual factors. In addition, there are considerable differences by sector of industry and, in particular, by status of project. The location-specific picture for the 17 individual factors shows some considerable differences from the general rating of restrictions and conditions by country. Of the 21 most important countries or areas, Turkey, Yugoslavia, Egypt, Nigeria, Pakistan, India and Venezuela occupy the top positions (most negative assessments by firms) for the seven most important individual factors. Further deterioration as compared with the past is reported for Turkey, the Islamic Republic of Iran and Venezuela, but also for such traditionally favourable investment locations as Brazil, Mexico and Singapore.

According to the firms questioned, there will probably be a tendency over the next few years for the number of planned investment projects in developing countries or areas to diminish; the negative reports outweigh the positive ones by 18 per cent. For various reasons, however, this does not necessarily mean that the rate of growth of direct investment in developing countries will be reduced. In the planning of new projects, Spain, Israel, the Islamic Republic of Iran, the Libyan Arab Jamahiriya and Liberia will tend to lose their attractiveness, while Indonesia, Malaysia, Venezuela, the Philippines, the Republic of Korea and Taiwan Province of China will be of particular interest to investors in the Federal Republic in the future.

What needs to be considered is whether economic policy restrictions and conditions in developing countries and areas can be seen as the reason for the slower rate of growth of direct investment in developing countries by the Federal Republic in recent years.

A simplified approach is proposed, in which the two following questions will be examined. First, are the developing countries or areas in which the growth of direct investment by the Federal Republic has slowed markedly those in which investors feel themselves particularly hampered by restrictions and conditions? Secondly, are the sectors of industry in which direct investment activity has slowed markedly those which are particularly sensitive to restrictions and conditions?

With regard to the first question, a study of capital transfer flows from the Federal Republic to the 15 most important developing countries or areas since 1969 shows no apparent connection between significance or change ratings for restrictions and conditions and trends in the volume of investment.

To answer the second question, the following calculation was made. First, the shares of the different industries in the 1978 and 1981 total investment figures were calculated and a ranking of percentage change established. Next, a ranking was drawn up of the industry-specific deviations from the average ratings of general obstacles and the five most important restrictions and conditions. The Spearman-Pearson coefficients of rank correlation (r) between the trend of direct investment in developing countries and its inhibition by general obstacles and conditions were found to have the following values:

Unstable political conditions:

Significance	$r = 0.5$
Change	$r = 0.38$

Unfavourable economic conditions:

Significance	$r = + 0.51$
Change	$r = + 0.5$

Economic policy restrictions and conditions (general):

Significance	$r = - 0.09$
Change	$r = + 0.01$

The five most important restrictions and conditions:

Significance and change	$r = - 0.16$
-------------------------	--------------

These findings show that there is no economically plausible correlation between the different obstacles and the trend of direct investment. This applies particularly to economic policy restrictions and conditions in the country or area concerned.

This still leaves two questions open, however. First, would the investment trend have been more positive without the obstacles? Secondly, will the factors assessed by firms as obstacles in the present and recent past inhibit investment in the future?

The increase of almost 80 per cent (net increase) in direct investment in 1980 compared with 1979 (first half-year) suggests a negative answer to the second question. In the course of the interviews, firms - particularly the larger ones - repeatedly stressed that while the general conditions and investment policies in developing countries frequently caused difficulties, that was not enough to frighten them off if market potential was sufficiently promising. It is therefore not surprising that the 10 locations that together accounted for 92.5 per cent of direct investment by the Federal Republic in developing countries or areas in the first half of 1980 included the biggest markets.*

In addition, the interviews showed that firms quite understood the general difficulties of the developing countries and the reasons for the investment policies whereby the least developed countries hoped to gain maximum benefit for their own economic development from industrial co-operation with foreign firms. Despite the bottle-necks and their tendency to get worse as time goes on, many firms clearly expect that the developing countries seeking foreign direct investment will be prepared in the long run to adjust their restrictions and conditions to their own co-operation objectives, so that the scope for operation by foreign investors is not narrowed to impossible limits.

Some of the restrictions that are felt to be obstacles in various developing countries also arise in an even more severe form - and are accepted in the Federal Republic. Examples are environmental pollution regulations, employment legislation and wage-policy provisions and taxation. Others will probably become less acute in the course of long-term development, such as difficulties in dealing with State authorities or conditions relating to the purchase of locally produced intermediates, if their supply and quality improve over the longer term, because - as the firms say - direct investment is the expression of a long-term commitment to entrepreneurial co-operation. On the other hand, it must not be forgotten that certain major constraints, perceived differently according to the sector of industry and size of firm involved, do cause investment projects to be abandoned. Those countries or areas that promote foreign direct investment therefore need to weigh up the advantages and disadvantages involved.

On the basis of the investigation, the following considerations suggest themselves:

Difficulties in dealing with the authorities, together with uncertainty about legal rights and the risk of nationalization, are reported as obstacles mainly by firms that have postponed or abandoned projects. In many cases, something could probably be done about these factors at relatively little expense and without any disadvantage to the development of the country. Some places, like Taiwan Province of China and Singapore, have already been successful in this direction, and others, like India, are making efforts to the same end. As these obstacles are named mainly by small and medium-sized firms, their removal could reduce the preponderance of large firms, often criticized by the developing countries and areas.

*Spain, Mexico, Singapore, Brazil, Argentina, Nigeria and Hong Kong, plus the exceptional case of the Netherlands Antilles.

The same applies to regulations concerning local capital participation, financing, the transfer of profits and the procurement of raw materials and intermediates. Here the regulations frequently seem to be too strict and rigid in general, with too little differentiation. Broken down by firm size and sector of industry, the ratings show particularly striking differences in the distribution pattern. The conditions could therefore be differentiated by size of project and sector of industry, as already happens to some extent, for example for priority industries. With regard to the size of projects, however, the impression is that large projects or large firms, who find things easier anyway, are encouraged more than small ones or are less hampered by restrictive conditions. Where appropriate, developing countries and areas should therefore consider whether the setting of priorities and the application of conditions is in fact in harmony with their development and industrial policy goals and whether relatively tight regulations concerning local capital participation and financing actually do ensure the expected positive development effects for the location concerned. As these factors are all too easily judged by investors as having substantive affinities with uncertainty about legal rights and the danger of nationalization, it is not impossible that their negative effects on direct investment are considerably greater than is generally assumed, quite apart from the associated administrative problems.

As regards the transfer of profits, in the first place it is basically true that the more favourably the investor assesses market prospects and future return on capital in the developing country concerned by comparison with alternative areas, the less anxious will he or she be to transfer profits. This attitude is further strengthened if the investor assesses the other general conditions as positive. It does, however, mean that capital and, other things being equal, profits too, will increase in the country and the transfer problem merely postponed.

As it is impossible to foretell in what configuration of economic circumstances investors will be more eager to transfer profits (apart from the general truth that the more uncertain and unfavourable the economic situation the keener they will be), it could be in the interest of the developing country or area to reach in the long term a relatively even balance between reinvested and transferred profits. For these reasons, carefully framed profit transfer regulations would probably have certain structural advantages for developing countries and areas. They would avoid too great an accumulation of the foreign share of ownership of the means of production without foreign direct investment. This argument obviously has to be seen in connection with the taxation of profits.

On the other hand, foreign firms can also transfer profits by taking advantage of the way in which imported intermediates and exported final products are priced. Developing countries have so far been unable to do anything about this and it is unlikely that even the most comprehensive controls will be able to prevent such transfers. This may explain why so many developing countries impose constraints that make life difficult for foreign investors but probably bear no relationship to the effort involved.

There are, nevertheless, opportunities for developing countries to control "clandestine" transfers of profits through policy measures. Conditions laid down for the procurement of raw materials and intermediates,

such as import restrictions and local-content rules, narrow the scope for transfers, while export requirements theoretically increase it. There does, in fact, appear to be a growing tendency for developing countries to adopt this sort of measure, the theory being that, if clandestine transfer of profits cannot be prevented, at least the export prices can be undervalued, thereby exacting a kind of export premium. This strategy is comparatively advantageous for developing countries from the development policy standpoint. First, it leads to additional growth and employment through the accelerator and multiplier effects achieved if the investor has to buy local products. Secondly, export requirements could make it possible to effect economies of scale. Convincing as these may be, they do presuppose the availability of local inputs and assume that the rules of international competition allow export prices to be calculated with a clandestine profit margin. It might also be possible to benefit exports by charging different prices on the domestic and export markets, so that the domestic market would be subsidizing exports. Foreign investors, on the other hand, would prefer to be able to import unlimited quantities of the required intermediates, as this would give them greater freedom to buy inputs at the best possible price and would possibly facilitate the clandestine transfer of profits. As a means of transferring profits, artificially high import prices are as a rule less risky than low export prices.

The significance of this conflict of interest varies from one country to another, but it needs to be taken into account by developing countries in their investment policies. In the long run, it probably makes sense for foreign investors to enter into a dialogue on the matter in an endeavour to assume that the regulations are applied with greater discrimination and flexibility. It would appear logical for them to adjust to the developing countries' strategy, since the general effect of "local content" conditions is to enlarge the market. Again, it may be advisable for the developing countries to frame their regulations more flexibly in order to make direct investment easier for small and medium-sized firms and for sectors of industry that have so far been frightened off.

These conclusions are far from exhaustive, and in any case it must be borne in mind that the basic background conditions vary from one place to another. The most important determinants are the economic situation, specific development potential and long-term economic and social policy of the country or area concerned.

The Federal Government and even the investors themselves do have opportunities - albeit limited ones - to co-operate in improving the general conditions for direct investment and resolving the conflicts associated with local restrictions and conditions. Another IFO study 2/ contains a number of recommendations on this. In particular, the Federal Government could offer:

(a) More opportunities for consultations with Governments of developing countries on the conflicts of interest referred to here;

(b) Support for initiatives relieving investors of the fear of expropriation;

(c) Experts to help Governments to work out a differentiated policy towards foreign investors and to advise the approval and control authorities;

(d) Better advice both to investors at home and to their representatives overseas, in particular through the provision of relevant information;

(e) More contact between embassies and the business world and legal experts in the developing countries in order to provide more effective economic and legal assistance to the investors concerned, in particular those in medium-sized firms;

(f) General support for multilateral efforts to improve entrepreneurial co-operation.

Notes

1/ A.J. Halbach, Deutsche Direktinvestitionen in Entwicklungsländern unter besonderer Berücksichtigung der industriellen Verlagerung (Munich, IFO-Institut für Wirtschaftsforschung, 1977), p. 12.

2/ For further discussion, see Jürgen Riedel and others, "Multilaterale Industriekooperation," IFO-Studien zur Entwicklungsforschung, vol. 7 (Munich, 1980), sects. C.II and C.III.

MANUFACTURING AS AN ENGINE OF GROWTH - REVISITED

John Weiss*

Introduction

In the early post-war period it was conventional for economists working on the problems of developing countries to assume that industrialization, and in particular manufacturing industry, had a key role to play in the process of long-run growth. This is clear from even a cursory examination of the writings of pioneers in this field, such as Nurskey, Lewis and Prebisch. Furthermore, international cross-sectional studies produced by Chenery and others revealed a strong association between the sizes of gross domestic product (GDP) and of the manufacturing sector: the natural assumption was that causation ran from the growth of the latter to that of the former. More recently, however, such views have been challenged and much has been written criticizing the type of industrialization that has taken place in developing countries in the post-war period, and in particular questioning its contribution to both growth and wider government objectives [1]. Partly in response to this more critical view of industrialization programmes, emphasis in the planning literature has tended to shift away from the implementation of broad strategies at a macro-economic level towards a more micro-economic approach in which efficiency of individual projects or sectoral plans is examined [1, 2]. Little and Mirrlees, in particular, have written scathingly on the misuse of strategies based on little more than hunches [3].

The object of the present paper is to re-examine the argument that manufacturing has a special role as an "engine of growth", and to discuss some empirical evidence that has recently been collected on this question.** Sutcliffe, in his textbook on industrialization and underdevelopment, cites a number of reasons for giving priority in some way to manufacturing: these include the demand it creates for other sectors through its linkage effects, its ability to earn or conserve foreign exchange, its impact on domestic savings, its employment effect, and the external economies it creates [5]. It should be noted however that none of these effects are necessarily unique to manufacturing and that, in a particular economy at a given time, whether or not they will be stronger for manufacturing than for other sectors will be an empirical question.***

*University of Bradford, Project Planning Centre.

**It must be stressed that the arguments discussed here do not imply priority for manufacturing at the cost of the neglect of other important sectors. As Baran puts it, "it would seem that what we are faced with is a vicious circle. There can be no modernization of agriculture without industrialization, and there can be no industrialization without an increase of agricultural output and surplus" (Baran [4], p. 277).

***Little, Scitovsky and Scott [1] point out that "infant industry" arguments can also be applied to agriculture.

There is an argument, however, that focuses directly on the special characteristics of manufacturing and has a very long history within economics: it is that manufacturing is the only activity that in the long-run is subject to increasing returns. This view stems from the distinction, conventional in the classical economists, between increasing returns in manufacturing compared with diminishing returns in agriculture, commerce being treated as an appendage of manufacturing. In its modern form the argument was taken up by Allyn Young [6], and expanded and elaborated upon by Kaldor [7, 8]. Cripps and Tarling [9] subjected Kaldor's generalizations to empirical testing, and Cornwall [10] extended and clarified the argument in a number of interesting ways. It should be noted, however, that all of the above works are concerned with the role of manufacturing in the growth of developed capitalist economies. The extension of this line of reasoning to developing countries has come only recently (for example Brailovsky [11] and Brailovsky, Eatwell and Ros [12]).

Manufacturing and increasing returns

Kaldor has provided the fullest statement of this position, and here attention will be focused initially upon his arguments. Kaldor's case starts from the observed statistical correlation, across a number of States members of the Organisation for Economic Co-operation and Development (OECD), between the growth of GDP and the growth of manufacturing; a similar correlation between GDP and other sectoral output is only found in the case of distribution and, as we shall see, Kaldor argues that here the causation is reversed [8].* Such an association is only important if one has a theory to explain what is special about manufacturing to enable it to play the role of an engine of growth. Kaldor's explanation is based on what he terms "dynamic increasing returns in manufacturing". It is not just a question of higher levels of output being associated with lower inputs per unit of output and thus higher productivity; this can be seen as economies of scale in a static sense, and such economies are potentially reversible when output contracts. Kaldor acknowledges that economies of this type will be found in non-manufacturing activities, at least up to some minimum efficient level of output. What he has in mind in the special case of manufacturing is a dynamic relation between the growth of output and the growth of productivity, which is attributable to greater skill developments, or "learning by doing", and to technological improvements. This means that the level of productivity is a function of cumulative output from the commencement of production, rather than the level of output at any one time. Another way of putting this is that continuous reductions in inputs and product quality changes result from continuous increases in output over time. Economies of this type, resulting from greater specialization and from production experience, as well as from technological improvements, should be irreversible.

As a means of testing the hypothesis of dynamic increasing returns in manufacturing, Kaldor used cross-sectional regression analysis to estimate

*The obvious point that such an association may simply reflect a correlation between a whole - GDP - and one of its parts - manufacturing - is countered by Kaldor with the fact that there is also a statistically significant relation between the growth of manufacturing and that of GDP net of the manufacturing sector.

equations (1) and (2) below for a number of different sectors across a sample of developed economies:

$$(1) \quad p_i = a + bq_i$$

$$(2) \quad e_i = a + bq_i$$

where q , p and e are the logarithmic growth rates of output, productivity and employment respectively in a given economy and i refers to a given sector.

Equation (1) is the familiar Verdoorn relationship between output growth and productivity growth, which has been found to hold true for many branches of economic activity.* Since by definition, however, $q_i = p_i + e_i$, it is possible to find spurious correlations between q and p , particularly when changes in employment are small. To allow for this, Kaldor argues that the key test for the existence of dynamic increasing returns is not only that equation (1) holds good, but that in addition equation (2) is statistically significant with $b < 1$, implying that while both productivity and employment growth rates increase with output growth, the increase in employment growth is proportionally slower. In Kaldor's original analysis, industry was the only sector for which equations (1) and (2) were both statistically significant.**

It should be noted that the validity of this test has been the subject of debate. First, an alternative interpretation of equation (1) would see causation running from productivity growth to output growth, and would place the explanation for differential rates of productivity growth on autonomously determined rates of technical progress [14]. Kaldor rejects this on the grounds that if one is considering equation (1) across branches within a sector, it would imply that different autonomously determined productivity growth rates would be fully reflected in relative price movements, and that the price elasticity of demand for all the commodities produced by the branches concerned would have to exceed 1.0.***

*See for example Salter [13]. In Kaldor's original analysis, productivity is defined as output per man-hour at constant prices.

**Industry is defined by Kaldor [8] as manufacturing plus construction and public utilities. Equations (1) and (2) hold true for industry as a sector and for its manufacturing and non-manufacturing components taken separately. Cripps and Tarling [9], however, found the Verdoorn relation to hold true only in manufacturing, although their test differs from that of Kaldor.

***Kennedy, in his survey of the data supporting both possible lines of causation, concluded that:

"... though it may be impossible to draw any direct conclusions relevant to our analysis from the observed price elasticities, the findings already mentioned about the correlation between changes in productivity and in price, and between changes in price and output, make it difficult, if not impossible, to maintain that the correlation between changes in output and productivity could come about due to the impact of productivity changes or output changes via relative price changes" (Kennedy [15], pp. 182-183).

Secondly, Rowthorn [16] pointed out that ordinary least squares regression techniques, when applied to models such as equations (1) and (2), will give biased estimates when the independent variable, in this case q , is not truly independent of the variables it is meant to explain. Rowthorn suggested that a more direct and satisfactory test would be to take e as the independent variable and to regress p on e . Cornwall [10], however, argued that for developed economies in the post-war period there was strong evidence that the growth of employment in manufacturing was determined by manufacturing output, so that e was itself not independent of the other parameters, and that Rowthorn's alternative was, if anything, less satisfactory.

There is agreement, however, that Rowthorn's procedure is inappropriate where there is a surplus of labour, since employment can adjust to changes in demand, and while it is questionable how far the labour markets of OECD economies in the post-war period can be characterized in this way, it is generally accepted that such conditions are still widely prevalent in developing economies. The conclusion of this particular debate appears to be that while a simultaneous equation estimation procedure may give a more satisfactory test of the hypothesis, if ordinary least squares techniques are to be applied, the Kaldor test is probably as good as any other, and is clearly superior in the labour-market conditions closest to those found in developing countries.*

Before considering some recent evidence on the question of increasing returns in manufacturing in developing countries, it is necessary to examine in more detail the mechanism whereby such dynamic economies might manifest themselves, with a view to clarifying why they are not judged to arise in other sectors. Kaldor himself is less than wholly clear on this question. As already noted, he refers to skill and learning effects in the work-force, and technological progress leading to improvements in techniques of production and the quality of final outputs, as key factors in the process.

*Kaldor acknowledges that cumulative theories of growth, which will be discussed further below, and upon which his own work has had a major influence, make it difficult to argue that q is wholly independent of p . He maintains however that:

"In saying that growth is explained by the increase in demand which is 'exogenous' to the growing sectors I am conscious of the fact that this statement is itself a simplification but one which does not invalidate the statistical inferences derived from it. The growth of industrial output for any region is governed in part by the growth in productivity, which itself influences demand through the change in competitiveness which is induced by it. It is this reverse link which accounts for the cumulative and circular nature of growth processes. There is a two-way relationship from demand growth to productivity growth and from productivity growth to demand growth; but the second relationship is, in my view, far less regular and systematic than the first." (Kaldor [17], p. 895, footnote 1.)

The emphasis on specialization, and thus improvements in skill levels in the work-force, is a restatement of Adam Smith's famous dictum that the division of labour depends upon the extent of the market.* There may be less scope for this type of specialization within other sectors, such as agriculture or services, but clearly it must be recognized that possibilities exist in these sectors, as they do in manufacturing.

A more substantial argument can be based upon Young's wider interpretation of the division of labour:

"No one as far as I know has tried to enumerate all of the different aspects of the division of labour and I do not propose to undertake that task. I shall deal with two related aspects only; the growth of indirect or roundabout methods of production and the division of labour among industries." (Young [6], p. 529.)

More significant than the static economies of large-scale production, according to Young, are those that arise as a result of increasing specialization and differentiation between firms, in particular as an increasingly complex set of supplier industries is established. The scale of these specialist producers is naturally dependent upon the extent of the market for the products for which they provide inputs. Young therefore sees productivity growth in manufacturing as arising primarily from what he terms "increasingly roundabout methods of production", since firms have the opportunity to become more specialized and to reap the advantages of specialization when the manufacturing sector expands.** However he stresses the fact that the nature of the process is such that it is not always possible to observe a relation between productivity growth for a firm or even a branch of industry and output growth at the firm or branch level. Individual firms benefit from the external economies provided by the greater specialization of their suppliers; similarly, at the branch level, the fast growth of a particular branch may have its immediate impact on the productivity of supplier firms located in a different

*Young pointed out that Smith's conception of the division of labour and specialization came to be widened by later economists:

"Today, of course, we mean by the division of labour something much broader in scope than that splitting up of occupations and development of specialized crafts which Adam Smith mostly had in mind." (Young [6], p. 529.)

Marx discusses some of the wider implications of the division of labour in capitalist production. (Marx [18], chap. XIV, sect. 4, pp. 350-358.)

**Young cites the case of the printing industry, where a range of specialist producers has taken over tasks previously handled by the printers themselves. He stresses that it is this characteristic of manufacturing which mainly accounts for productivity gains:

"... the principal economies which manifest themselves in increasing returns are the economies of capitalistic or roundabout methods of production. These economies are largely identical with the economies of the division of labour in its most important modern forms." (Young [6], p. 531.)

branch. In these circumstances, Young argues, it is necessary to see industrial operations as an interrelated whole: this implies that the most appropriate level for testing the hypothesis of increasing returns in manufacturing is that of the aggregate of all manufacturing activities, which is the level at which Kaldor conducted his original analysis.

In addition to Young's arguments on specialization, Cornwall gives a further insight into the mechanism of increasing returns in relation to technological change. Citing the work of Schmookler [19], he argues that activity in the capital goods branches can be an important means of transmitting technological progress to other branches and sectors. If inventions are classified by branch of use, the rate of appearance of inventions may be influenced by recent investment in the using branches, on the grounds that past investment in these branches is an indication to capital goods producers that future demand for equipment from these branches is likely to be strong. The capital goods producers may, therefore, concentrate their applied research on the needs of the user branches, who in the recent past have expanded their capacity significantly; from this research, technical progress and improved equipment may result. Since there is likely to be an association between past output growth and past investment, this hypothesis establishes a link between output growth and technological progress through the responsiveness of capital goods producers. Technological progress is seen as leading to applied technical change, which culminates in productivity growth.* This argument, however, suggests that there may be an association between output and productivity growth at the branch level within manufacturing; nonetheless, it provides no basis for such an association at the firm level.

A variant of this argument follows Arrow [20] on the question of learning by doing, with particular reference to capital goods producers. In this view, learning may take place in capital goods production as the result of an expansion of cumulative output and growing experience in these branches; investment growth will stimulate the demand for capital goods, and the learning experience among producers of these goods will be spread widely within the economy through purchases of cheapened or improved capital equipment.**

*Cornwall distinguishes between technological progress - the discovery of inventions - and technical progress - their actual application. (Cornwall [10], p. 129.)

**Consistently with this position, Kaldor [21] argues that, while technical progress embodied in the form of new investments in fast-growing industries plays a role in the process whereby high output growth is related to high productivity growth, this role is a relatively minor one unless it is combined with increasing returns. This is because the process identified is one of accelerating productivity growth in the faster growing industries, and while the latter may attract more investment, it will only ensure continually accelerating productivity growth in these industries if the rate of technical progress over successive vintages of capital is itself accelerating. In other words, it is not a case of more investment per se causing accelerating productivity growth; the investment must embody new technologies and thus be subject to increasing returns.

It must be stressed that Cornwall's argument on technological improvements as a mechanism for transmitting productivity growth is directed explicitly at developed capitalist economies. It is obvious that where capital goods producers do exist in developing countries one cannot expect original theoretical research to emerge in response to demands for more equipment: what will be relevant will be adaptations of and improvements to known, chiefly imported, technologies. While this transmission mechanism is clearly of a qualitatively different type to that envisaged for developed economies, there is substantial historical evidence to suggest that "late-comer" economies can make substantial gains in production efficiency through the adaption of imported technology, provided they have a minimum initial base in terms of an equipment-producing industry and a skilled labour force.

The view of the uniqueness of manufacturing that emerges from this discussion can be summarized as follows:

(a) Manufacturing, unlike the other major sectors - agriculture and services, is characterized by increasingly interrelated and specialized branches of activity. To use Young's terminology, it has the potential for a high degree of roundaboutness in its production structure and thus, when its aggregate output expands, there is a far greater scope for the division of labour and specialization within the sector itself than is the case for the other sectors. In other words, in input-output terms, manufacturing has potentially much higher intrasectoral linkages;

(b) The manufacturing sector produces the capital equipment used by all sectors. Endogenous technical progress within manufacturing induced either by its own expansion or by the expansion of other parts of the economy, will feed back to all users of capital equipment and thus raise the technical level of all sectors.

Clearly this is not meant to imply that agriculture or services do not have strong linkages - backward or forward - with other sectors. The point is that the expansion of these sectors does not offer the same scope for division of labour and specialization within the sectors themselves: furthermore, technical change in these sectors is not passed on as it would be through the purchase of capital equipment. It should, however, be made clear that this line of reasoning does not minimize the role that can be played by agriculture in the growth process. Kaldor [8], for example, stresses the importance of agriculture at an early stage of economic development both as a supplier of wage goods and as a market for industrial products. Furthermore, he does not deny that agriculture can experience rapid productivity growth; what he suggests, however, is that this productivity growth results from technical innovations or institutional changes which raise yields per acre. It does not require an acceleration in the growth of sectoral output to allow a greater division of labour within agriculture; in other words, more specialized agricultural inputs are not required to allow the expansion of agricultural output. Kaldor takes as proof of this the fact that equation (2) does not hold true for agriculture in the sample of developed economies he examined; therefore while there is a relation between output and productivity growth - and equation (1) is statistically significant - this output growth does

not require the employment of more workers in the sector.* In developing countries, there is clearly the possibility that productivity in agriculture may be negatively associated with employment growth if surplus workers in agriculture are absorbed by an expanding manufacturing sector.

Similar arguments apply to services. Most of Kaldor's comments are directed towards distribution; he found a high correlation between the growth of the sector and that of GDP across the group of developed countries in his sample, but argues that the growth of distribution simply reflects the growth of commodity production, so that causation runs from the growth of GDP to that of sectoral output. Furthermore, he suggests that even in developed countries, but clearly much more so in developing ones, there is a large potential for increasing the output of the distribution sector with a given labour force; this implies that productivity improvements in distribution will largely be a response to the growth of production in the primary and secondary sectors. As with agriculture, Kaldor accepts the possibility of productivity growth in services through static economies of large-scale production, such as those resulting from the introduction of supermarkets, but distinguishes these from the dynamic economies arising from an extension of the division of labour in manufacturing.

In summary, Kaldor sees manufacturing acting as an engine of growth, since its growth will raise productivity not just in the sector itself, through an extension of the division of labour, but also in the other major sectors; productivity is likely to rise in agriculture through the absorption of surplus workers off the land, and in services because of the increased output of the distribution sector. Further productivity gains and technical progress in manufacturing will be passed on to other sectors through their purchases of capital and intermediate goods. It should be noted, however, that Kaldor [17, 21] argues that the engine-of-growth view of manufacturing will hold true whether or not it is subject to what he terms "dynamic increasing returns". This is on the grounds that an expansion of investment and production in manufacturing will generate the profits to finance further growth, and surplus workers from agriculture or services can be employed in manufacturing with no loss of output elsewhere. In other words, the argument is that the opportunity cost of investment finance and labour for manufacturing will be zero, or at least low. One might dispute the realism of the analysis underlying this view of manufacturing expansion, but even if the opportunity costs involved are very low, similar arguments could be applied to capitalist development in agriculture or some service branches, such as tourism; investments in these areas could also generate their own investment surpluses and employ surplus workers. The case for the engine-of-growth view seems to hinge,

*Kaldor [8] points out that in the developed economies that have specialized in agriculture, the sector employs only a relatively small proportion of the working population. His point is that a developing economy that chose to specialize in agriculture alone and to import its requirements of industrial goods might achieve a high level of output in relation to the numbers employed in agriculture, but that agricultural expansion would employ only a small portion of the work-force, since the possibilities for specialization within agriculture to supply its needs for inputs are limited.

therefore, on the validity of the hypothesis regarding the existence of dynamic increasing returns in manufacturing. Naturally one would expect this phenomenon to be weaker in the case of developing countries because of their far lower level of industrialization. It has, however, been argued recently that substantial capitalist development - particularly in the industrial sector - has taken place in these economies in the last two or three decades [22]. It may be appropriate, therefore, to consider how far this industrialization has exhibited a tendency towards dynamic increasing returns, which the Young-Kaldor argument suggests played such a key role for the present developed economies.

Empirical evidence of increasing returns in manufacturing

Apart from Kaldor's original statistical analysis, work to test his generalizations for developed economies has been conducted by, among others, Cripps and Tarling [9] and Cornwall [10].* It is only quite recently that the analysis has been extended to developing countries. Brailovsky [11] demonstrated the importance of manufacturing in the Mexican economy. He obtained similar results to those of Cripps and Tarling for developed economies, in that the correlation between sectoral output growth and growth of GDP was high only for manufacturing and commerce (see table 1). In the case of manufacturing, this was not because it was an important component of GDP, since a significant correlation was also found between manufacturing growth and growth of GDP net of manufacturing.** Brailovsky tested equations (1) and (2) using time series

*Rowthorn [16] pointed out that Cripps and Tarling's conclusion regarding the existence of dynamic increasing returns in manufacturing is dependent upon the inclusion of Japan, which he argued was a special case of a late-comer economy, in their sample of countries. Kaldor [17] replied that Cripps and Tarling's test of regressing productivity on employment was inappropriate and that using his test (equations (1) and (2)), significant results were obtained with the exclusion of Japan.

**The regression coefficient for the relation between manufacturing and GDP growth was less than 1, supporting the assertion by Kaldor [8], that the overall growth rate of an economy will be higher in proportion to the excess of the growth of manufacturing over that of other sectors (t-ratios in parentheses):

$$y = 0.01 + 0.75 \bar{q}_m + 0.73 (q_m - \bar{q}_m) \\ (8.78) \quad (9.50)$$

$$R^2 = 0.90; D.W. = 1.48$$

where y is the growth of GDP, \bar{q}_m is the long-run trend growth of manufacturing and q_m is the actual growth of manufacturing

See Brailovsky [11] for an explanation of the calculation of \bar{q}_m . The regression coefficient of \bar{q}_m , which equals 0.75, represents the long-run elasticity of GDP with respect to manufacturing.

data on manufacturing and found both to be statistically significant. He comments that time series data on employment were not available to extend the analysis to other sectors; however, a rough test was carried out by the present author using cross-sectional data on employment, output and productivity across 45 Mexican branches. For the period 1960-1973, equations (1) and (2) are both statistically significant for 20 manufacturing branches, but only equation (1) holds good for non-manufacturing. In other words, outside manufacturing there was no relation between the expansion of production and employment growth and thus, using Kaldor's test, there was no evidence for the existence of dynamic increasing returns.*

Table 1. Correlation of the rate of growth of output in various sectors with the growth of GDP
(Coefficient of determination R^2)

Sector	Twelve OECD countries (1950-1970)	Mexico ^{a/} (1960-1978)
Manufacturing	0.90	0.81
Construction	0.70	0.58
Public utilities	0.16	0.34 ^{b/}
Agriculture	0.04	0.32
Mining	0.00	0.01
Transport	0.66	0.29
Commerce	0.85	0.95
Other services	0.40	0.56

Source: For OECD countries, Cripps and Tarling [9], table 3.1; for Mexico, Brailovsky [11], table 2.

a/ The regressions are time series.

b/ Electricity only.

*The forms of equation (2) (t-ratios in parentheses) are:

Manufacturing (1960-1973)

$$e = 0.20 + 0.43q$$

(3.50)

$$R^2 = 0.39; n = 20$$

Non-manufacturing (1960-1973)

$$e = 0.52 - 0.17q$$

(0.16)

$$R^2 = 0.05; n = 25$$

The coefficients were calculated by the author from data supplied by the Ministry of Industry and Natural Resources, Mexico City.

Data have also been compiled to allow testing for the existence of dynamic increasing returns in manufacturing for groups of developing and developed economies [12]. A study was made of 31 countries, 16 developing and 15 developed, over two separate international cycles, 1965-1973, and 1973-1978.* A number of interesting points emerge from an examination of these data.

First, the relatively close relation between the growth of manufacturing and the growth of GDP holds good for the group of developing as well as developed economies, although neither group has a correlation coefficient as high as that found by Cripps and Tarling (see table 2). There is a slight tendency for the correlation coefficients and significance of the regression coefficients to be higher for the group of developing countries.

Table 2. Cross-country regressions between rates of growth of GDP y and manufacturing output q_m by groups of countries, national peak years

Country group	1965-1973			1973-1978		
	a	b	R ²	a	b	R ²
All countries	1.72	0.58 (9.78)	0.77	2.58	0.42 (6.46)	0.59
Developing countries	2.02	0.56 (6.71)	0.75	2.67	0.42 (5.05)	0.65 _{a/}
Developed countries	1.55	0.58 (5.37)	0.71	1.79	0.58 (4.02)	0.59 _{b/}

Source: Brailovsky, Eatwell and Ros [12], table 2.1.

Notes: 1. Form of equation: $y = a + bq_m$
2. Figures in parentheses are t-ratios.

_{a/} Excluding Venezuela.

_{b/} Excluding Norway.

*For individual countries, data were calculated between national peak years within the overall international cycles 1965-1973 and 1973-1978. The developing countries in the sample were those in which the manufacturing sector has surpassed a certain minimum absolute size. The precise criteria used to select the countries were not given in the original paper.

Secondly, for developing countries, equations (1) and (2) were found to be statistically significant for manufacturing in both periods examined, although for developed countries the increasing returns relationship appears to have broken down in the second period, since equation (2) was not significant, and equation (1) only weakly so (see table 3).^{*} It is important to note that from equation (1) a given rate of growth of manufacturing output is associated with a lower rate of productivity increase and a higher rate of employment growth in developing as opposed to developed economies. This is consistent with the explanation given above for the transmission of increasing returns and productivity growth throughout manufacturing. It is obvious that manufacturing sectors in developing countries are far less integrated than they are in developed economies, in the sense that the degree of specialization has been carried much less far, and a higher proportion of manufactured goods is provided from outside manufacturing itself in the form of imports; smallness of the capital goods sector is a particular manifestation of this lack of integration, which would suggest that the benefits of the division of labour within manufacturing are more difficult to acquire for developing economies.^{**}

Nonetheless, the statistical significance of equations (1) and (2) can be interpreted as implying that the limited degree of industrialization that has taken place in these economies has led to some specialization and productivity gains and that manufacturing is beginning to play a similar role to the one it played in the past development of today's developed economies.

Thirdly, perhaps one of the most interesting aspects of the data is that they provide support for the argument of Allyn Young that productivity growth is a "macro" phenomenon. This proposition implies that for any individual branch productivity performance will be affected significantly by the behaviour of the whole of the manufacturing sector in the country in which it is located. One test of this is to compare, for each branch, the ranking of countries by productivity growth with the ranking of the same countries in terms of productivity growth in manufacturing in the aggregate. If the proposition is valid, one would expect significant

^{*}The authors suggest that this may be due, at least in part, to "degenerate productivity growth", in the sense that, as a result of the recession, in certain branches in the industrialized countries productivity rises as output and employment fall when inefficient or marginal producers are closed. If the more successful producers acquired their extra workers from within manufacturing as labour moved out of marginal firms, this would help further to explain the non-significance of equation (2).

^{**}This important point will be taken up further below. It should be noted that this conclusion, namely that the benefits in terms of productivity for a given rate of output growth in manufacturing are lower in developing than in developed economies, is at variance with explanations of productivity growth based on "catching-up" theories of technology borrowing [16].

rank correlation coefficients, implying that countries with fast rates of productivity growth in total manufacturing also do relatively well in individual industries. The authors found significant rank correlation coefficients in 9 out of 12 industrial branches in the first period, and in 11 out of 12 in the second. They also looked at the variance of productivity growth rates both between individual branches within a particular country and within particular branches across countries. If the "macro" phenomenon hypothesis holds, one would expect a substantially lower variance of productivity growth within individual countries; this was also confirmed.

A final piece of evidence can be obtained by extending the authors' original analysis and looking at the forms of equations (1) and (2) for individual branches across countries where productivity and employment growth in a branch are regressed on output growth in the same branch; these results can be compared with similar regressions across countries for manufacturing as a whole. The results for the group of developing countries are given in table 4. It can be seen that for equation (1), the coefficient of determination R^2 and the significance (t-ratio) of the regression coefficient are higher for 5 out of 13 individual branches than for manufacturing in the aggregate in the period 1965-1973, and for 3 out of 13 in the period 1973-1978. In the case of equation (2), however, on which it will be recalled that Kaldor places great stress, in the first period the values of R^2 and the t-ratio are higher for only 1 of the 13 branches than for manufacturing as a whole, while for the second period these parameters are higher for manufacturing in the aggregate than for any of the individual branches. This suggests that, with a few exceptions, the equations underlying the phenomenon of dynamic increasing returns to manufacturing are statistically more significant when one looks at total manufacturing rather than at the behaviour of individual branches.*

Obviously, results such as those are not comprehensive enough to establish conclusively the validity of generalizations such as those contained in the engine of growth hypothesis discussed here. However, within the limitations of the test suggested by Kaldor, there is evidence that the manufacturing sector, in developing countries where industrialization can be seen as having passed some threshold limit, exhibits tendencies towards dynamic increasing returns that are similar to (if weaker than) those observed in the past in developed economies. The implications of this phenomenon are taken up in the final section.

Implications of the engine-of-growth hypothesis

The most direct implication of this view of the process of growth is by no means new. The engine-of-growth hypothesis in the form discussed here is really a restatement of what were once regarded as conventional views on the importance of industrialization. Young states that:

"... the mechanism of increasing returns is not to be discerned adequately by observing the effects of variations in the size of an individual firm or of a particular industry for the progressive division and specialization of industries is an essential part of the process by which increasing returns are realized. What is required is that industrial operations be seen as an inter-related whole."*

*In fact, for most branches equation (2) is not statistically significant, suggesting the relevance of externalities at the sectoral level rather than the branch level.

Table 4. Cross-country regressions for branches of the manufacturing sector in 16 developing countries

A. Equation (1)

Branch	1965-1973			1973-1978		
	a	b	t-ratio	a	b	t-ratio
Food, drink and tobacco	-1.38	0.75	6.13	0.71	0.63	3.62
Textiles	-0.27	0.50	3.36	0.43	0.62	5.97
Wood	-0.16	0.69	4.51	0.57	0.67	3.89
Paper	1.30	0.29	2.00	0.21	0.58	3.18
Chemicals	3.97	0.07	0.32	0.00	-0.52	0.40
Petrochemicals	-4.42	0.84	6.61	0.74	0.40	2.41
Non-metallic minerals	0.83	0.36	2.48	0.29	0.81	2.98
Basic metals	-1.34	0.50	2.68	0.32	0.63	3.39
Metal products	0.67	0.50	2.08	0.22	-1.62	2.93
Non-electrical machinery	-7.77	0.99	8.64	0.83	0.51	5.24
Electrical machinery	4.46	0.11	0.98	0.06	-3.97	4.38
Transport equipment	-0.81	0.77	5.07	0.63	1.20	4.16
Others	-0.43	0.33	1.18	0.08	-0.08	5.50
Total manufacturing	0.67	0.38	4.13	0.53	4.53	0.61
					-0.48	4.80
					0.54	0.60

continued

Table 4 (continued)

B. Equation (2)

Branch	1965-1973			1973-1978				
	a	b	t-ratio	R ²	a	b	t-ratio	R ²
Food, drink and tobacco	1.38	0.25	2.03	0.21	0.94	0.37	2.15	0.24
Textiles	0.27	0.50	3.35	0.43	0.93	0.38	3.70	0.48
Wood	0.16	0.31	2.00	0.21	-2.59	0.32	1.88	0.19
Paper	-1.30	0.70	4.81	0.61	0.71	0.42	2.29	0.26
Chemicals	3.97	0.93	4.52	0.58	0.52	0.60	3.67	0.47
Petrochemicals	4.42	0.16	1.26	0.09	4.13	0.19	0.70	0.03
Non-metallic minerals	-0.83	0.64	4.39	0.56	0.78	0.37	2.00	0.21
Basic metals	1.34	0.50	2.68	0.32	1.62	0.26	1.04	0.07
Metal products	-0.67	0.50	2.10	0.22	-0.51	0.27	1.91	0.19
Non-electrical machinery	7.77	0.01	0.06	0.00	3.97	-0.01	-0.06	0.00
Electrical machinery	-4.46	0.88	7.46	0.79	-1.20	0.08	0.49	0.02
Transport equipment	0.81	0.22	1.48	0.13	0.08	0.08	0.49	0.02
Others	0.43	0.67	2.37	0.27	-4.53	0.80	2.40	0.28
Total manufacturing	-0.67	0.62	6.71	0.75	0.48	0.46	4.12	0.53

Source: Data compiled by the Ministry of Industry and Natural Resources, Mexico City, for Brailovsky, Eatwell and Ros [12].

This statement, the last sentence of which deserves special emphasis, is very close to the case for industrialization based on its effects external to individual firms, which has been made by many development economists of varying intellectual positions, the point being that one needs to plan for an integrated industrial expansion rather than looking at the possibility of establishing individual industrial projects.

Two qualifications must, however, be made to the argument as it has been presented up to this point. First, as many commentators have pointed out, simple parallels between the behaviour of the manufacturing sectors in developed and developing economies can be highly misleading. It is a well-known fact that in most developing countries the extent of intermediate and capital goods production is relatively small. This structural imbalance in comparison with the position in developed economies may be due to a variety of factors, including difficulties in acquiring and assimilating foreign technologies, the relatively small size of potential markets for these commodities and lack of finance either in domestic or in foreign currency. Since the increasing differentiation of production and accumulation of experience in these branches is the main mechanism through which dynamic increasing returns in manufacturing are said to operate, difficulties in establishing these branches in developing countries will obviously weaken the impact of the dynamic economies associated with manufacturing expansion. There are, however, at least two possible reactions to this situation. One, which is based on calculations of short-run allocative efficiency, would suggest concentrating resources only on the domestic production of intermediate and capital goods in which a developing economy has a reasonable chance of becoming internationally competitive in the short run. Little and Mirrlees, two of the most influential advocates of this approach, gave it the label "trade in intermediates". The alternative strategy would be to override short-run efficiency considerations on the assumption that in the long run the establishment of a more integrated industrial structure would produce dynamic gains both for manufacturing and for the whole economy. The differences in approach stem in part from a difference in time perspective and in part from a different interpretation of the importance of externalities in manufacturing.**

*Quoted from Young [6], p. 529.

**Young's comments on the time perspective in which industrialization programmes must be viewed are again of interest:

"... it would remain a process requiring time. An industrial dictator with foresight and knowledge could hasten the pace somewhat, but he could not achieve an Aladdin-like transformation of a country's industry, so as to reap the fruits of a half-century's ordinary progress in a few years. The obstacles are of two sorts. First the human material which has to be used is resistant to change Second the accumulation of the necessary capital takes time, even though the process of accumulation is largely one of turning part of an increasing product into forms which will serve in securing a further increase of product." (Young [6], p. 534.)

This leads to the second qualification. Economists, and not only those writing from a neoclassical position, have been rightly critical of the vagueness with which arguments relating to externalities have been put forward.* This vagueness led Little and Mirrlees [3] to suggest that, even if external effects were important for industrial investments, they were difficult to identify, at least at the level of the individual project; thus, if it could be assumed that they were of roughly equal importance for all industrial investments, they could be safely ignored. It is argued here that the engine-of-growth hypothesis taken largely from Kaldor and Young provides a more convincing view of externalities in manufacturing than do previous statements of this position, and that empirical work following this approach has provided evidence on the existence of externalities attached to manufacturing in the aggregate.** This is still, however, not enough for detailed planning purposes. Relatively large numbers of industrial branches come under the general categories of capital and intermediate goods, and planners need guidance on how to maximize the external benefits, in terms of productivity growth and technical change, arising from an industrialization programme. In this sense, Little, Scitovsky and Scott [1] are clearly correct in pointing out the need to identify which branches are most likely to stimulate these dynamic gains. Also, it is clear that short-run costs in terms of allocative efficiency cannot simply be ignored and some balance must be struck between such costs and dynamic long-run gains. If the general reasoning of the engine-of-growth hypothesis is correct, there remains a major area for research here, in terms of clarifying the mechanisms through which increasing returns arise and linking them with projects in particular branches.

Returning to the question of the implications of the hypothesis, a second broad implication relates to the interpretation of the nature of growth. Several economists have pointed to growth's cumulative or self-reinforcing characteristics.*** The engine-of-growth hypothesis, as

*For example, Sutcliffe writes that:

"Industrial as opposed to other kinds of investment, it is argued, is most effective in stimulating new attitudes towards technology, economic incentives and the idea of growth and social change. Even if it is true the argument in this form is seldom more than vague. Where it is given economic support this often involves its proponents waving at their critics blank cheques, signed by influential economists, and drawn on the bank of external economies." (Sutcliffe [5], p. 84.)

**The case put forward here for an integrated expansion of a manufacturing sector emphasizing intrasectoral linkages specialization, applied research and learning is similar in many respects to the "basic materials' strategy" suggested by Thomas [23], although Thomas does not draw upon the Kaldor hypothesis for his evidence.

***Myrdal [24] used the term "cumulative causation" to explain widening income inequalities between regions or national economies. This term has been adopted in several recent studies; see for example Cripps and Tarling [25].

discussed here, has as one of its key elements the view that technological progress and the resulting productivity growth are endogenous to the growth process; this is in contrast to models in which technological progress is given exogenously. If fast growth of output in manufacturing can generate technical change and productivity growth, this will provide a mechanism for improving an economy's international competitive position, either in price or non-price terms, thus relieving its balance-of-payments constraint; the removal of the latter will in turn allow faster growth and so the cumulative process may continue. This interpretation of the nature of growth provides an argument for stimulating a rapid growth of the manufacturing industry through government expenditure, or through expansionary fiscal and credit policies. Such a strategy will naturally have major implications for trade policy, because fast growth of domestic demand, even if it raises productivity in the medium or longer term, will have a negative short term effect on the balance of payments. One possibility is to attempt to create export-led growth through various fiscal incentives and an appropriate exchange-rate policy. If, however, one is sceptical of the possibility of a developing country raising its non-traditional exports significantly in the short run, one must return to some form of import control as the major means of protecting the trade balance from the potential import demand created by rapid domestic expansion. This line of reasoning can be seen as an extension of the familiar infant-industry case for protection. While the latter related improved productivity in a particular industry to time, the argument presented above would add the rate of growth of output in the industry itself and that of manufacturing in the aggregate as key explanatory variables. In a sense, therefore, one has an "infant economy" rather than a specifically infant-industry case for protection.

The cumulative or potentially self-supporting nature of growth can be expressed formally in a number of relations.* As already noted, the key link is between output growth and productivity improvements; productivity

*One possibility is expressed in equations (3)-(6) below:

$$(3) \quad q = a + b_1 I + b_2 x$$

$$(4) \quad x = a + b_1(p_d - p_f) + b_2(p_d - e - p_f) + b_3 z$$

$$(5) \quad m = a + b_1(p_f - p_d) + b_2(p_f + e - p_d) + b_3 y$$

$$(6) \quad p_d = a + b_1 q$$

where q , x and m are the growth rates of manufacturing output, exports and imports respectively,

z and y are the growth rates of world and domestic income respectively,

I is the growth rate of total investment,

p_d and p_f are the growth rates of domestic and foreign manufacturing productivity respectively,

p_d and p_f are the growth rates of domestic and foreign manufacturing prices respectively,

e is the movement of the exchange rate.

Equation (3) states that growth rate of manufacturing output is deter-

mined gains will affect price or non-price trade competitiveness, or both. Dixon and Thirlwall [26] and Thirlwall [27] have given formal models of this new version of the cumulative causation view of growth, using relative prices alone as a competitive explanatory variable for export performance.* Thirlwall [27] shows that a model employing the Verdoorn relationship between output and productivity will produce a higher growth of national income consistent with balance-of-payments equilibrium than a model without the assumed link between output and productivity growth, provided the Marshall-Lerner condition is fulfilled. It should be noted, however, that Thirlwall's exposition leaves initial causation unexplained; the process appears to be set off by a windfall gain in competitiveness in particular exports - perhaps as a result of exogenous technical progress; an alternative explanation is that growth of the internal market creates this improved competitiveness through relative productivity growth.**

Perhaps few would dispute that, potentially at any rate, growth can create an environment favourable to further expansion. It is clear that an initial expansionary stimulus can become self-sustaining if the increasing-returns phenomenon is operative, so that higher productivity gives a boost to exports, or to internal demand through the incentive to invest. Naturally growth is not inevitably self-sustaining and a range of

by the growth rate of total investment and of the export demand for manufactures. Since manufacturing, it is hypothesized, is a key factor in explaining growth of GDP, it would be inappropriate to include y as a separate explanatory variable for q . Equation (4) makes the export growth rate a function of two alternative competitive variables - one of which can be omitted if it is insignificant, or, as is likely, there is multicollinearity - plus the growth rate of world income. Equation (5) is a similar function for imports with the income term now relating to domestic income. Equation (6) is the Verdoorn relation linking the growth rates of productivity and output.

It is necessary to establish a link between productivity and prices through a price mark-up equation so that

$$(7) \quad P_d = w - P_d + m,$$

where w is the rate of growth of wages and m is the growth rate of the percentage mark-up on labour costs.

Finally, one may add a balance-of-payments constraint so that $x = m$ over a given period.

*Cripps and Tarling [25] derived a series of propositions from the cumulative view of growth, which they tested against the post-war experience of a number of developed economies. One of their findings was that relative price changes had no observable association with changes in export market shares. They found relative growth rates for internal markets, with their associated productivity effects, to be more significant competitive variables.

**See Thirlwall [27], pp. 264-273.

possible bottle-necks - internal and external - may frustrate the process.* The greatest differences of interpretation are likely to arise over the nature of these constraints. Kaldor [8] for example, suggests that scarcity of foreign exchange would be the key bottle-neck, while others might consider domestic savings as the only real gap to be covered.**

While these issues cannot be discussed in full here, some evidence can be put forward which, superficially at least, supports elements of the cumulative causation case. For example, one can compare the relative performance of countries in different international cycles; taking a group of 16 developing countries and ranking them in terms of growth of manufacturing production at constant prices for two separate periods 1965-1973 and 1973-1978, there is a positive rank correlation coefficient of 0.56. A similar exercise for a group of 15 developed countries gives an even higher rank correlation coefficient of 0.79.*** These results suggest that there is an association between relatively good performance over one cycle and a good performance in a subsequent period.

Another indirect test of one of the main elements of the cumulative causation view of growth is first to establish a link between output growth and productivity growth, and secondly to relate productivity growth to export performance. As was noted above, the author found equations (1) and (2) to hold true in a cross-sectional analysis over 20 branches of Mexican manufacturing industry. An export function, including Mexican productivity growth for each branch in relation to a weighted average of productivity growth in the same branch for trade competitors, was used to

*Baran makes this point clearly in a passage in which he anticipated many of the arguments raised here:

"While the investment snow-ball effect is clearly synonymous with economic development and necessarily implies the appearance of external economies, the emergence of facilities that could give rise to external economies need not by any means result in increased investment and in general economic growth. To put it differently, synchronized acts of domestic investment reflecting increased division of labour and causing a cumulative widening of internal markets create as a by-product external economies; that is conditions which in turn facilitate further division of labour and further investment. However for this improvement of conditions for investment to result actually in further investment, economic and social development must have reached a stage in which there is the possibility for a transition to industrial capitalism." (Baran [4], p. 191.)

**Kaldor [28] gives the distributional model underlying this position; investment is taken to increase profits, so that the savings necessary to finance investment are generated in the growth process itself.

***The groups of countries studied are those examined in Brailovsky, Eatwell and Ros [12]. Both rank correlations are significant at the 95 per cent level. Data for this exercise were collected at the Ministry of Industry and Natural Resources, Mexico City. As noted earlier, individual country cycles within the two periods are used to calculate growth rates.

attempt to explain the growth of Mexican exports to the United States of America in relation to total United States imports in individual branches. Relative productivity growth proved to be a statistically significant explanatory variable when combined with the initial share of Mexican imports in the United States market for each branch for the cycle 1965-1973; over the more recent period 1973-1978, however, it proved to be less significant.*

These results suggest that in Mexico output may be linked to productivity and productivity to export in the cumulative process.

In concluding this survey of the engine-of-growth hypothesis regarding the manufacturing sector, it is important to stress again the fact that the ideas discussed are familiar ones, expressed, perhaps, in a slightly different form. It is suggested, however, that the Young-Kaldor arguments provide a sharper focus for some of the standard views on the role of industrialization. The neo-classical interpretation of industrialization, as exemplified by Little, Scitovsky and Scott [1] can only be challenged on the basis of genuinely dynamic arguments, and one starting point for these must be an explanation of why productivity growth rates and technical change differ between economies. These issues are at the core of the engine-of-growth hypothesis, and although much remains to be done to substantiate this hypothesis more fully, it is the contention of the author that it provides one of the most useful bases for a challenge to the free trade position.

*For the period 1965-1973, the result of a cross-sectional analysis over 12 manufacturing branches (t-ratios in parentheses) was:

$$m_{Mex} - m_{US} = 42.20 + 1.67(P_{Mex} - P_{comp}) - 8.68s_{Mex}$$

$$(2.49) \qquad \qquad \qquad (-8.97)$$

$$R^2 = 0.88; n = 12$$

where m_{Mex} and m_{US} are the growth rates of United States imports from Mexico and total United States imports in each branch (1965-1973) respectively,

P_{Mex} and P_{comp} are the growth rates of Mexican and competitors' productivity in each branch respectively, and

s_{Mex} is the initial (1965) share of Mexican imports in total United States imports in each branch.

All growth rates are in natural logarithms.

For the period 1973-1978, relative productivity growth was a weaker explanatory variable, significant only at the 90 per cent level and with a low value of R^2 :

$$m_{Mex} - m_{US} = 5.94 + 1.51(P_{Mex} - P_{comp})$$

$$(2.02)$$

$$R^2 = 0.29; n = 12$$

Data for the analyses were compiled at the Ministry of Industry and Natural Resources, Mexico City.

References

1. I. Little, T. Scitovsky and M. F. Scott, Industry and Trade in Developing Countries (Oxford, Oxford University Press, 1970).
2. I. Little and F. Mirrlees, Manual of Industrial Project Analysis (Paris, Organisation for Economic Co-operation and Development, 1968).
3. I. Little and J. Mirrlees, Project Appraisal and Planning for Developing Countries (London, Heinemann, 1974).
4. P. Baran, Political Economy of Growth (New York, Monthly Review Press, 1957).
5. R. B. Sutcliffe, Industry and Underdevelopment (New York, Addison Wesley, 1971).
6. A. Young, "Increasing returns and economic progress", Economic Journal, December 1928.
7. N. Kaldor, Causes of the Slow Rate of Economic Growth of the United Kingdom (Cambridge, Cambridge University Press, 1966).
8. N. Kaldor, Strategic Factors in Economic Development (Ithaca, New York, Cornell University Press, 1967).
9. T. F. Cripps and R. J. Tarling, Growth in Advanced Capitalist Economies (1950-1970), Occasional Paper No. 40 (Cambridge, University of Cambridge, Department of Applied Economics, 1973).
10. J. Cornwall, Modern Capitalism (London, Martin Robertson, 1977).
11. V. Brailovsky, "Industrialization and oil in Mexico: a long-term perspective", Oil or Industry, T. Barker and V. Brailovsky, eds. (New York, Academic Press, 1981).
12. V. Brailovsky, J. Eatwell and J. Ros, "Cumulative causation in industrial development" (Mexico City, 1981).
13. W. E. G. Salter, Productivity and Technical Change (Cambridge, Cambridge University Press, 1966).
14. J. Wolfe, "Productivity and growth in manufacturing industry - some reflections on Professor Kaldor's inaugural lecture", Economica, May 1968.
15. K. Kennedy, Productivity and Industrial Growth (Oxford, Clarendon Press, 1971).
16. R. Rowthorn, "What remains of Kaldor's law", Economic Journal, March 1975.
17. N. Kaldor, "Economic growth and the Vendoorn Law: A comment on Mr. Rowthorn's article", Economic Journal, December 1975.
18. K. Marx, Capital, vol. I (Laurence and Wishart, 1970).

19. J. Schmookler, Invention and Economic Growth (Cambridge, Massachusetts, Harvard University Press, 1966).
20. K. Arrow, "The economic implication of learning by doing", Review of Economic Studies, June 1962.
21. N. Kaldor, "Productivity and growth in manufacturing industry: a reply", Economica, November 1968.
22. B. Warren, Imperialism Pioneer of Capitalism (Verso, 1980).
23. C. Thomas, Dependency and Transformation (New York, Monthly Review Press, 1974).
24. G. Myrdal, Economic Theory and Underdeveloped Regions (New York, Methuen, 1957).
25. T. F. Cripps and R. J. Tarling, "Cumulative causation in the growth of manufacturing industry" (Cambridge, University of Cambridge, Department of Applied Economics, 1975).
26. R. J. Dixon and A. P. Thirlwall, "A model of regional growth rate differences on Kaldorian lines", Oxford Economic Papers, July 1975.
27. A. P. Thirlwall, Balance of Payments Theory (London, MacMillan, 1980).
28. N. Kaldor, "Alternative theories of distribution", Review of Economic Studies, No. 2 (1955/56).

TECHNOLOGICAL INNOVATION AND SOCIAL COST BENEFIT ANALYSIS IN DEVELOPING COUNTRIES

David A. Phillips*

Background

The role of technological innovation in economic growth has long been accepted in the context of industrialized economies. For example, the 1920s hypotheses of Kondratieff concerning long-wave technological cycles are now being invoked to explain the world recession in terms of the "rationalizing down-swing" of the age of electronics. For developing countries, however, the interest in the part played by technology has, until fairly recently, been concerned not so much with domestic innovation processes but rather restricted to the conditions under which technology should be transferred from industrialized countries and how it should be selected from whatever "menu" is available. This has involved the analysis of transfer mechanisms, technology cost and regulation, the choice of technique and domestic technology development policy within the assumed context of technological dependence (e.g., Cooper [1, 2] and Vaitos [3]).

Over the past few years, however, following case studies of technical innovation in, for example, Brazil, the Republic of Korea and the Taiwan Province of China, it has been shown that significant product and process innovation has occurred on the periphery, contrary, it would appear, to the predictions of the dependency model of the late 1960s and early 1970s. There is some controversy about the political-economic nature of these developments and their implications for technological "catching-up" (Frank [4] and Kaplinsky [5]). Leaving this aside, however, to the extent that domestic innovation is a feasible option in Brazil, the Republic of Korea and the Taiwan Province, it follows that economic planning may need to incorporate innovation effects. Planning for innovation has not been carried out in any detail in developing countries but only in the general terms of perspective planning, for example in India. The present paper is concerned with the rationale and practicality of taking account of innovation effects within a particular planning technique - social cost benefit analysis. It is an attempt to conceptualize conditions under which process innovation may be predictable at the project level.

Social cost benefit analysis: some issues

Over the 30 years or so since it was formally introduced into planning methodology, social cost benefit analysis (SCBA) has probably received a disproportionately high input of academic and professional effort in its development and application and a corresponding amount of criticism, sometimes bordering on hysteria. The reason for this is that SCBA appears to offer simple (or, for some, simplistic or erroneous) answers to complex questions about investment and economic development. The fact that the technique has survived and apparently extended its influence may be because, in the end, it is theoretically (and practically) justified

*University of Bradford, Project Planning Centre.

or, at the other extreme, because it is merely a useful device for providing spurious scientific justification for the investment decisions of Governments and aid agencies and the interests they represent. Whatever the case, the technique is, in some form or another, in fairly wide use, and its application and rationale therefore remain an important issue.

The objections to the use of SCBA may be classified into those concerned with its fundamental principles and those concerned with its application. In the first case, its roots in the price system (international or domestic) and neoclassical economic concepts of value are thought to abstract from, or negate, structural or transformational objectives of development, whereby necessary changes in the pattern of production are largely predetermined, for example by the need to disengage from dependency relations (see Thomas [6]). Instead it calls for project-by-project decision criteria (usually in terms of trade efficiency). The value neutral basis of some of the parameter estimates (for example consumption utility weights) has been challenged on the grounds that they reflect class interests rather than some collective social interest (Stewart [7]). Another objection arises from the implications of the theory of the second best whereby, even accepting neoclassical resource allocation objectives, the move towards economic efficiency in a particular sector or project is not necessarily consistent with the move towards the general economic optimum. Hunt and Schwartz describe SCBA as the highest stage of neoclassical economic vulgarization: "it is utter folly in a society rife with social conflict to repeat ... the well-fed hypocrisy that proclaims business as usual, let's go ahead and internalise a few externalities, equate a few margins" ([8], p. 32).

In the second case, objections are more technical than fundamental. They concern the difficulties in estimating parameter values; inherent uncertainty of estimates; problems in identifying and quantifying certain external effects (intangibles etc.); excessive sophistication of the techniques (that is, the excessive cost of using such techniques in relation to benefits in terms of improved decision-making); the use of skill-intensive ("inappropriate") planning techniques to identify "appropriate" (e.g., labour-intensive, poverty focused) projects. Some of these issues are discussed in Joshi [9]; Chambers [10] is concerned with rapid appraisal methods for rural areas.

The particular question that the present paper addresses is to what extent SCBA can handle certain dynamic aspects of the development process. In this respect current fully elaborated versions of the technique (Little-Mirrlees [11], UNIDO [12] and Squire-van der Tak [13]) do take dynamics into account, albeit within the neoclassical model, through the intertemporal efficiency objective. This is accounted for by incorporating a weight on savings applicable in an economy with a suboptimal rate of accumulation - the optimal rate being determined by the level of savings at which social marginal rates of transformation and substitution of current for future consumption are equalized. The use of a savings weight also results in a reduced social discount rate, implying a higher relative value for future over present consumption.

The technique also goes outside the confines of neoclassical welfare economics by introducing income weighting, that is, interpersonal comparisons of utility of income based on the distributional judgements of Governments. In addition, there is no reason in principle why SCBA cannot overcome objections to its static character by using long-run input and output prices that anticipate likely future effects of planned transformation of the structure of production and demand. The practical forecasting problems would be formidable, but this is not a difficulty confined to SCBA planning. Project analysis is probably in fact better able to cope with "primary uncertainty" than alternative centralized planning techniques, which use more aggregated data and make more heroic assumptions, e.g. linearity. (These points are elaborated upon by Lal [14].) However, the dynamic phenomenon of interest here - the innovation process - does not come within the sphere of pricing, short- or long-run; it would be classified under the general label of technological external effects and requires a different treatment.

Externalities and technical innovation

It is not clear that partial equilibrium project analysis can handle externalities associated with a highly interdependent productive sector, i.e., a sector within which there are important supplier-user linkages.* This may not be a problem if the views of Little and Mirrlees ([11], p. 344) are accepted:

"If the establishment of backward linkages is sought for its own sake, without economic appraisal, then the social profitability of a project, whose costs consist to a considerable extent of the purchase of parts, is likely to be reduced, not raised ... It should not be imagined even when it seems likely that small scale manufacturers could supply components for a new venture, that there is anything automatic about the development of backward linkages. Sometimes it happens; often it does not."

With regard to forward linkages Little-Mirrlees are just as sceptical, if not more so, and generally look to foreign trade optimization as a preferable alternative to setting up forward linkages in the domestic economy.

However, the generation of domestic linkages is central to the conception of structural change and transformation, which in turn are supposed to involve external benefits for individual economic activities. In addition, high levels of interdependence are thought to be closely associated with innovation processes and the inducement to innovate. This high level of interdependence is associated particularly with the machinery and equipment industry which, at least in industrialized economies, is characterized by a high degree of specialization, or the breaking down of complex manufacturing processes into stages with continuous supply and feedback of technical information between supplier and user (see Rosenberg [17] and Stewart [18]). This level of interdependence leads to an internal

*The concept of linkages as external effects was explored by, for example, Scitovsky [15] and Fleming [16].

technological dynamic of a semi-autonomous type. It is therefore postulated that there is a relationship between linkage externalities on the one hand and externalities of induced technological innovation on the other.

The role of technological innovation in economic growth has been understood for a long time; the importance of technical progress was investigated empirically by a number of research groups in the 1950s and 1960s. Solow [19] estimated that about 87.5% of the increase in output per capita in the economy of the United States of America between 1909 and 1949 was due to technical advance, with 12.5% due to simple capital accumulation (capital deepening). However, technological research and development has been monopolized by a small group of industrialized economies, and within these economies it has been further concentrated in a few sectors (petrochemicals, electrical and industrial machinery, electronics, vehicles etc.) and within these sectors in a few international firms. Research and development within international firms has been concentrated furthermore in the parent country, despite the expansion of ownership and production to overseas subsidiaries. Only in some low-technology industries has research and development been extended to subsidiaries, for example in the wood products industry where research and development is relatively insignificant [20]. Herrera [21] showed research and development expenditure in Latin America at 0.2% of GNP, compared with 2-3% of GNP in industrialized countries. Griffin [22] cited the statistic that only 2% of world research and development took place outside industrialized countries, and much of this was inappropriate to local production or demand requirements or, in Cooper's term, marginalized [1].

For the above reasons, the prima facie case for promoting research and development and technical innovation in developing countries appears clear-cut. Before accepting this conclusion, however, it is necessary to examine the implications of changes that have taken place in world industrial production since the beginning of the 1970s. Since 1970 significant increases in relative industrial growth rates have occurred throughout the non-industrialized world and particularly in South-East Asia and Latin America. The structure of industrial production has, at the same time, shifted away from light manufacturing towards capital goods, especially in Brazil, Mexico, the Republic of Korea and Taiwan Province, with a corresponding increase in machinery exports [21], Lall [22] and Balassa [23]. In the electronics sector, expansion of production that started as final assembly operations or subcontracting to foreign companies has in some countries induced backward linkages into domestic component manufacture and technical innovation in components. Larger firms in the Republic of Korea are by now self-reliant in terms of domestic supply of components (J. Clarke and V. Cable [24]). Indian plant and machinery have been widely exported, for example to East Africa, and Indian technology is available to developing country purchasers.

These developments have complicated the issues of transfer and choice of technology. It is now necessary for countries to make a choice between importing appropriate technology and developing it locally. Previously, a major justification for fostering local technology was to reduce advanced technology imports from the monopoly suppliers in labour-scarce industrialized economies, since such technology was inappropriate to local factor endowments. The existence of third world technology sources has now to

some extent weakened this rationale for developing indigenous technology for countries with low-cost access to appropriate technology imports. This is the situation in Nepal for example. Should Nepal, which is located geographically close to the relatively powerful north Indian industrial belt, channel resources into a local technology effort if low-cost appropriate equipment is available from India? For example, India supplies Nepal with such equipment for a wide variety of major industries such as textiles, sugar, grain milling, paper and sawmilling. Nepal could restrict research and development to specific local resource-intensive technology rather than general factor-intensive technology (an example of which could be micro-hydro-generation equipment).

The rationale for indigenous technological development has become less clear-cut; nevertheless, if a general case remains, it may be said that indigenous technological development can lead to the:

(a) Elimination of possible excess profits accruing to foreign suppliers of equipment and materials;

(b) Establishment of local control over production and material usage, avoiding excessive management and technical fees and royalties and reducing the possibility of surplus drains via transfer pricing;

(c) Creation of technical skills generally applicable to the economy (i.e., skills that yield net external benefits over and above the cost of training, wages etc.);

(d) Saving of foreign exchange (if it is in short supply);

(e) Establishment of conditions under which cost-reducing innovation could occur.

Within the context of SCBA, however, a dissenting view comes, again from Little and Mirrlees:

"Should some industries be favoured more than others? We are not aware of any research which would permit the project evaluator to incorporate any allowance for the comparative knowledge-spreading effects of new industries, products and processes. ... We confess to a certain cynicism about those supposedly important commercial 'spin-offs' which are always claimed, but seldom substantiated, when a government supports a new technology such as atomic power or supersonic transport." ([11], p. 337.):

Accounting for technical innovation in SCBA

The questions that arise in attempting to quantify technological effects are: (a) whether projects in certain sectors are more likely to induce productivity increases through innovation; (b) how such improvements could be identified and measured; and (c) under what circumstances it is justified to incorporate innovation effects (by innovation, embodied process innovation is meant). Other types, e.g. disembodied learning, may be applicable to particular types of productive activity (presumably skill-intensive), but these are not considered here. (For a discussion of such phenomena see Westphal [25] and Bell [26].)

Despite the development of various technological forecasting techniques, specific technical developments that become commercially successful are subject to considerable uncertainty (Arrow [27]). Failure rates are high, and the more radical an innovation is, the greater the uncertainty in both technical and market terms. Freeman [28] cited the example of early forecasts for computer usage. The 1955 optimistic forecast for 1965 computer stocks in the United States was 4,000. Actual stocks in 1965 were 20,000 - 400% above the forecast. For incremental technical innovation in existing processes the market uncertainty is lower; however, the problem for planners would be not so much to predict the commercial results of innovation but to predict *a priori* the specific industries in which innovation is likely to occur. This requires both detailed process information and a global perspective.

It may be possible to postulate certain technical and economic conditions in which future technological innovation is most likely to occur. Innovation may be most likely to occur within economic activities in which there are high interdependencies both in the activities (industries) and via linkages to other activities. This does not mean that linkages are a sufficient condition for process innovation but that such conditions are fertile soil for innovation and that it may therefore be possible to make *a priori* predictions about innovation-generating projects in industries where interdependencies are high within the industry itself and between the industry and other productive sectors.

The relationship between interdependency, technical innovations and growth is most clear for the capital goods sector. Projects within this sector, or within user sectors that induce output expansion in the local capital goods sector at an early stage of development (e.g. industries requiring low-technology machinery and equipment), are therefore relatively likely *a priori* to generate innovation effects. In Taiwan Province, according to Amsden [29], leading machine tool manufacturers started out as textile machinery manufacturers who responded to demands from an expanding textile industry for relatively low-technology equipment. In addition to its generally high level of interdependency, the equipment sector has also recorded the highest growth elasticities, approaching 2.5 in the case of electrical equipment [21]. Over the period 1970-1979, electrical machinery production in Asia achieved 15% growth per annum, with the Republic of Korea achieving 40% during the period 1972-1976 and correspondingly very high export growth, in excess of 60% (Clarke and Cable [24]).

Empirical evidence on interdependencies within industry has been fairly extensive. Early estimates (Chenery and Watanabe [30]) showed that for Italy, Japan and the United States the highest total backward (L_B) and forward (L_F) linkages (defined by the simple aggregation L_B and L_F) occurred in metal processing. More recent estimates for six industrialized countries (Yotopoulos and Nugent [31]) showed basic metals ranking second out of 18 in terms of total linkages (defined using the input-output inverse matrix to take account of successive rounds of demand and supply linkages). A study of six Asian economies (Panchamukhi [32]) showed a tendency for metals and engineering to have the highest total linkages. In India, the Philippines and the Republic of Korea metals, metal products and transport equipment scored high. (However, in some input-output analysis justice is not done to the importance of the capital goods sector in the linkage league because it is classified as supplying to final demand.)

Amsden [29] shows possible contradictory evidence for Taiwan Province, where machinery producers have tended not to specialize but to integrate various stages under one roof, from casting to assembly. However, there are compelling intuitive arguments for the innovation-generating power of specialization.

In the case of economies with low manufacturing-GDP ratios, that is, those at a relatively early stage of industrialization, the linkage structure typical of an industrialized economy is not necessarily applicable since the state of underdevelopment is associated precisely with a low level of interdependency. The point has been made that a typical linkage structure may in the final analysis be irrelevant to the aspirations of underdeveloped economies (e.g., Raj [33]) on the grounds that typical structures are influenced by the income distribution and engineered consumer tastes of affluent capitalist societies. Nevertheless, Raj argues that there is likely to be a general convergence in the course of the development process.

Explicitly taking account of the relationship between inter-industry linkages and the rate of technological change, Strassman [34] proposed a model for the prediction of the innovation-generating potential of particular activities. For any increase of $x\%$ in the productivity of industry A, an increase of $fp\%$ occurs in the productivity of all activities supplying A and purchasing from A, where f = a coefficient of technological transmission, p = the proportion of input of user industries purchased from A or the proportion of output of feeder activities supplying to A and f is defined as the potency of an innovation in one industry for inducing technological change in another. The backward linkage f would arise through scale economies in A's suppliers, and the forward linkage f would arise through a reduction of costs relative to quality of A's products supplied as inputs to other productive activities. Productivity increases are potentially passed on through several rounds of transactions between different industries, depending on the values of x , p and f at each stage. The higher the level of linkages the greater will be the effects. In a highly interrelated industry such as machinery manufacture this mechanism will affect both the capital and consumer goods sectors from both the supply and the demand side, whereas productivity increases in the consumer goods sector only affect capital goods on the demand side (via demand for equipment) while otherwise they affect final demand (i.e. consumers) rather than production.

Hirschmann [35] incorporated into his analysis of linkages a probability concept. The total linkage effect of setting up activity A was defined as $\sum x_i p_i$, where x_i is the increased net output created in industry i and p_i is the probability of the linkage(s) being realized in practice. The probability p depends on the economic feasibility of setting up the backward linking activity; for the forward linkage from A to activity B, p depends on the proportion of B's input purchased from A. (If the supply of A's product is only a minor component of B's output, p is likely to be low.)

While the above concepts do provide a possible methodology for predicting a priori which industries are likely to induce external effects of innovation, the problems are not really resolved. Strassman's f is inherently unpredictable unless the linking industries in question are already in operation, and even then there are problems in predicting exactly how

a given cost-reducing innovation will affect the cost structures of linking activities. On the other hand Hirschmann's p is probably even more difficult to estimate, since the formation of linkage in developing countries is not constrained purely by technical-economic factors (e.g. minimum economic scale) but by political-institutional factors. Hirschmann [36] in fact analyses such factors (see below). However, it may be possible to derive indicators of technological effects of projects by sensitivity or probability analysis on a range of values for f and p in the same manner that distribution weight parameters can be derived in conditions of uncertainty.

Choice of techniques

Clearly, the choice of appropriate techniques has implications for the rate of innovation and vice versa. The extensive literature on this subject has concerned itself with optimal choice in terms of resource allocation and reinvestible surplus (Sen [37]) and with more practical questions of production economics (Pickett [38], Bhalla [39] and Boon [40]). Studies have also been concerned with widening the choice to involve indirect inputs (infrastructure, materials, transport etc.), scale and product specifications (Stewart [18]). However, little has been said with regard to innovation externalities, although Stewart ([18], p.154) pinpoints small-scale capital goods manufacture as critical, as does the author (Phillips [41]).

There is evidence that small-scale labour-intensive manufacture requiring relatively unsophisticated equipment has induced early backward linkages into equipment production. One example is the equipment required for Indian small-scale open-pan sugar production.* Such equipment has been developed and built by small-scale provincial engineering firms in India, and reportedly well over 1,000 improved open-pan sugar mills have come into operation over the past 20 years. The technical innovation work was carried out in this case by the public sector (the National Sugar Institute and the Planning Research and Action Institute) and the technology has been transferred to a number of countries in Africa and southern Asia. If viable small-scale manufacture can be associated in general with the acceleration of capital goods production and innovation, then an additional argument exists for choosing labour-intensive, small-scale technique over and above the conventional allocational arguments. Amsden [29] also provides empirical evidence of the relationship between low-technology manufacturers of final goods and the demand for low-technology machinery and equipment in Taiwan Province. Given the condition that small-scale unsophisticated equipment is required, Hirschmann's p value could be high, signifying a relatively high probability of linkage creation.

An ongoing study by the author into textile technology choice in Nepal may illustrate some of the above points. The study examines six alternative technical set-ups. These include traditional throw-shuttle weaving (7% of 1979 output), fly-shuttle looms (45% of output), pedal looms (4% of output), mini-power looms (4% of output) and conventional power looms (40% of output). Over time throw shuttles have died out,

* This case has been subject to a remarkable amount of attention in the literature, increasingly resembling a medieval clerical argument.

superseded increasingly by fly-shuttle looms after 1946, which are in turn being challenged by pedal looms. At the same time mini-power looms installed at the cottage level have been introduced; at the medium- to large-scale level, partly with State backing, conventional power loom units are threatening to pre-empt further small-scale development.

The pedal loom, known in India as the Nepal loom, is an indigenous development that has also been electrified using imported electric motors. Recently a further modification by a small-scale engineering firm introduced an automatic cut-off device to stop the loom when weft yarn runs out. This reduced down time and supervision requirements. The output per loom per shift on the non-electrified pedal loom (12-15 linear metres) is about double that of fly-shuttle looms. With electrification, the output per worker is further significantly increased by higher output per loom per shift (20 linear metres) and lower labour requirements per loom. Apart from imported motors, all equipment of the type described can be manufactured locally. In addition, mini-power looms have been assembled locally; certain precision parts are imported from India. The inducement to innovate arose from the demand for improved equipment by the small-scale weaving enterprises.

Given the importance of textile production in GNP of poorer countries and the possible economic efficiency of certain small-scale processes, this is a sector in which the potential for a viable linkage to local equipment production seems promising, at least in situations where a number of small-scale techniques are established. However, such externalities are not necessarily relevant to private enterprise profit calculations, and without State involvement the linkages and any external innovation opportunities may be pre-empted by medium- to large-scale textile factories, which benefit from internal technical economies of scale. It would be very difficult for a planner, whether at the micro or macro level, to decide how to anticipate innovation benefits, if at all. At the same time, State assistance should depend on the long-term economic viability of small-scale weaving which may, in turn, depend on forecasting viable domestic technological innovations for which planners are unlikely to have much information.

A noteworthy example of an economically unjustified effort by the State to maintain a small-scale textile industry incorporating domestic linkages between materials, production, equipment and final products is that of India's cotton khadi industry. This case suggests that it cannot be assumed that linkages, even if established, will generate effective innovation or growth. The modernization of khadi spinning backed by the Indian Government (including the development of the 12-spindle charkha) has not made it economic, and its share in output has fallen steadily over a number of years.

Conclusion

There are a number of points worth making about linkages, innovation and investment planning. Even assuming that this type of systematic method were adopted for incorporating potential innovation effects into project analysis, the question of whether and to what extent identified linkages will actually materialize is unresolved (i.e., Hirschmann's p is uncertain). The existence of linkages does not imply causation: as

Hirschmann points out, they are as much an effect as a cause of industrial development. On the other hand, Thomas [6] elevates linkages to a central role in the development process. But both Hirschmann and Thomas recognize that the creation of linkages requires conditions outside the technical sphere. Hirschmann [36] analysed the structure of private economic interests that act against the establishment of backward linkages from import-substituting industry. Thomas' convergence strategy [6] presupposed a socialized economy with public control over productive resources. In the case of India, the heavy-industry strategy of the 1950s which stressed capital goods as the basis of long-term development did not result in the expected linkage effects (Raj [33]). Capacity was underutilized and steel industry output was diverted into the production of higher income consumer goods (e.g. domestic utensils) because of the effect of inequalities of income distribution.

The creation of linkages "on the ground" depends to some extent on political and institutional conditions (e.g., the structure of ownership of productive assets), resources (finance and entrepreneurship, both public and private), production economics etc. In South-East Asia the momentum of export growth has itself encouraged such development. The arguments of Little and Mirrlees against taking account of linkages in project appraisal are based on two main points: (a) they may not materialize in practice; and (b) given adequate foreign trade elasticities, the creation of domestic linkages per se is not necessarily an advantage and may be a disadvantage. Point (a) is uncontroversial but, to the extent that innovation and linkages are related, point (b) could be invalid.

The practicalities of, as opposed to the general justification for, incorporating innovation effects into project analysis, probably restrict such analysis to carefully specified projects where specific knowledge exists of possible technical advances, costs and market information and the local technological capacity. In such cases technological forecasting techniques may be of some help in quantifying the effects; these techniques have, however, been used largely in existing enterprises rather than in making a priori predictions for new projects. (For example, Rohatgi [42] cites a United States study in which 71% of 162 surveyed companies, largely in high-growth industries, carried out technological forecasting.) In the absence of detailed information, the simple fact that a project is set up on fertile soil for innovation (e.g. in an industry with high interdependencies) does not allow firm conclusions to be drawn, and the inclusion of innovation effects would probably only be justified, if at all, in qualitative terms and rather provisionally. However, it has been shown by Amsden [29] and others that innovation inducement has been associated with low-technology industries in general, where they have backward linkages to low-technology machines and equipment supply. Empirical research might be able to give more basis for Strassman's fpx measures of technical transmission, at least so that a sensitivity analysis approach could be used on the variables; however, the general possibilities of quantifying such effects do not appear promising, and therefore the effectiveness of SCBA remains to be judged within its customary more restricted allocational and distributional objectives.

References

1. C.M. Cooper, ed., Science, Technology and Development (London, Frank Cass, 1973).
2. C.M. Cooper, "Policy interventions for technological innovation in developing countries", World Bank Staff Paper No. 441 (Washington, D.C., World Bank, December 1980).
3. C.V. Vaitsos, Intercountry Income Distribution and Transnational Enterprises (Oxford, Oxford University Press, 1974).
4. A. Gundar Frank, "Third world manufactured export production", Discussion Paper No. 37, Development Studies (Norwich, University of East Anglia, 1979).
5. R. Kaplinksy, "Trade in technology; who, what, where and when" (Brighton, Institute of Development Studies, 1982).
6. C.Y. Thomas, "Dependence and transformation: Economics of the transition to socialism", Monthly Review Press, 1974.
7. F. Stewart, "A note on SCBA and class conflict in LDCs", World Development, vol. 33, No. 1 (1975).
8. E. Hunt and J. Schwartz, A Critique of Economic Theory (Harmondsworth, United Kingdom, Penguin, 1972).
9. V. Joshi, "The rationale and relevance of the Little-Mirrlees criterion", Oxford Bulletin of Economics and Statistics, February 1972.
10. R. Chambers, "Project selection for poverty-focussed rural development: Simple is optimal", World Development, vol. 6, No. 2 (1978).
11. I. Little and J. Mirrlees, Project Appraisal and Planning for Developing Countries (London, Heinemann, 1974).
12. Guidelines for Project Evaluation (United Nations publication, Sales No. E.72.II.B.11).
13. L. Squire and H. van der Tak, Economic Analysis of Projects (Baltimore, Johns Hopkins Press, 1975).
14. D. Lal, Prices for Planning (London, Heinemann, 1980).
15. T. Scitovsky, "Two concepts of external economies", Journal of Political Economy, April 1954.
16. J.M. Fleming, "External economies and the doctrine of balanced growth", Economic Journal, June 1955.
17. N. Rosenberg, "Capital goods, technology and economic growth", Oxford Economic Papers, vol. 15 (1963).

18. F. Stewart, Technology and Underdevelopment (London, Macmillan, 1977).
19. R. Solow, "Technical change and the aggregate production function", Review of Economics and Statistics, August 1957.
20. Transnational Corporations in World Development: A re-examination (United Nations publication, Sales No. E.78.II.A.5).
21. A. Herrera, "The social determinants of science policy", Science Technology and Development, C.M. Cooper, ed. (London, Frank Cass, 1973).
21. World Industry Since 1960: Progress and Prospects (United Nations publication, Sales No. E.79.II.B.3).
22. S. Lall, "Developing countries as exporters of industrial technology", Research Policy, No. 9, 1980.
23. B. Balassa, The Newly Industrialized Countries in the World Economy (Oxford, Pergamon, 1981).
24. J. Clarke and V. Cable, "The Asian electronics industry looks to the future", IDS Bulletin, March 1982.
25. L. Westphal and others, "Korean industrial competence: Where it came from", World Bank Staff Paper, No. 469 (Washington, D.C., World Bank, 1981).
26. R.M. Bell, "Learning and the accumulation of industrial technological capacity in developing countries" (Brighton, University of Sussex, 1982).
27. K. Arrow, "Economic welfare and the allocation of resources for invention", The Economics of Technological Change, N. Rosenberg, ed. (Harmondsworth, United Kingdom, Penguin, 1971).
28. C. Freeman, "Uncertainty, project evaluation and innovation", The Economics of Industrial Innovation (Harmondsworth, United Kingdom, Penguin, 1974).
29. A. Amsden, "The division of labour is limited by the type of the market; The case of the Taiwanese machine tool industry", World Development, vol. 5, No. 3 (1977).
30. H. Chenery and T. Watanabe, "International comparisons of the structure of production", Econometrica, October 1968.
31. P. Yotopoulos and J. Nugent, Economics of Development: Empirical Investigations (New York, Har-Row, 1976).
32. V. Panchamukhi, "Linkages in industrialisation: A study of selected developing countries in Asia", Journal of Development Planning (United Nations publication, Sales No. 75.II.11).

33. K.N. Raj, "Linkages in industrialisation and development strategy: Some basic issues", Journal of Development Planning, No. 8 (United Nations publication, Sales No. 75.II.A.1).
34. P. Strassman, "Inter-related industries and the rate of technological change", Review of Economic Studies, 1959.
35. A. Hirschmann, The Strategy of Economic Development (New Haven, Yale University Press, 1958).
36. A. Hirschmann, "The political economy of import substituting industrialisation in Latin America", A Bias for Hope (New Haven, Yale University Press, 1971).
37. A.K. Sen, Choice of Techniques: An Aspect of the Theory of Planned Economic Development (Oxford, Basil Blackwell, 1968).
38. J. Pickett and others, "The choice of technology in developing countries", World Development, vol. 5, No. 9 (September 1977).
39. A.S. Bhalla, ed., Technology and Employment in Industry (Geneva, International Labour Office, 1981).
40. G.K. Boon, Technology and Sector Choice in Economic Development (Alphen aan den Rijn, Netherlands, Sijthoff and Noordhoff, 1979).
41. David A. Phillips, "Choice of technology and industrial transformation: the case of the United Republic of Tanzania", Industry and Development, No. 5 (United Nations publication, Sales No. E.80.II.B.4).
42. P. Rohatgi and others, Technological Forecasting (New York, McGraw-Hill, 1979).

THE LIMA TARGET AND SOUTH-SOUTH CO-OPERATION:
A STATISTICAL REVIEW

Secretariat of UNIDO

The Second General Conference of UNIDO held at Lima, Peru, in 1975 culminated in the Lima Declaration and Plan of Action, which called for increasing industrial production in the developing countries to the maximum possible extent and "as far as possible to at least 25 per cent of total world industrial production by the year 2000". 1/

The 25 per cent share referred to in the above Declaration has become widely known as the Lima target. The purpose of this article is to assess the likelihood of achieving the Lima target based on past trends, and to underscore the importance of South-South co-operation as a critical factor for the realization of the target.

In the context of the present world industrial order, the realizability of the Lima target appears to be limited. The share of the developing countries in world manufacturing value added (MVA) increased slowly from 8.2 per cent in 1960 to 10.9 per cent in 1980. Trend least squares were fitted to the share data for the periods 1961-1980 and 1970-1980 and the following results were obtained:

$$(1) \text{ MVAS} = 7.493 + 0.1488 t \\ (44.68) \quad (10.63)$$

$$R^2 = 0.86, \text{ D.W.} = 0.259, 1961-1980$$

$$(2) \text{ MVAS} = 6.3667 + 0.2267 t \\ (21.61) \quad (11.71)$$

$$R^2 = 0.95, \text{ D.W.} = 1.34, 1970-1980$$

where MVAS is the share of the developing countries in world MVA, t is time, and the numbers in parentheses are t -values. 2/

The trend line fitted to the more recent data of 1970-1980 shows a slightly faster average annual growth in the share of the developing countries of world MVA (.23) than over the longer period of 1961-1980 (0.15). But the projected share of the developing countries in the year 2000 obtained from the two regression equations are strikingly similar: 13.45 per cent using equation (1) and 13.39 per cent using equation (2). It is apparent, therefore, that if present trends continue, the attainment of the Lima target is out of the question and the share of the developing countries will not even reach 15 per cent.

It is easy to calculate the average growth-rate differential by which the annual growth rate of the MVA of the developing countries must exceed that of the developed countries to reach the Lima target. If the 1980 share of about 11 per cent is taken as an initial condition, the differen-

tial is found to be 4.96 per cent. Algebraically,

$$(3) \quad r_1^* = 4.96 + r_2, \text{ 1980-2000}$$

where r_1^* is the Lima MVA growth rate of the developing countries and r_2 the MVA growth rate of the developed countries.

The relationship between the actual MVA growth rate of the developing countries r_1 and that of the developed countries may be written

$$(4) \quad r_1 = a + br_2$$

where a and b are structural coefficients that can be estimated statistically, using time-series data. The Lima growth-rate gap can be defined as the difference between equations (4) and (3):

$$(5) \quad r_1^* - r_1 = (4.96 - a) + (1 - b) r_2$$

Equation (5) partitions the Lima gap into two components, one attributable to the endogenous growth factor within the developing countries and the other attributable to the weakness of the linkage between the developing and the developed countries (measured by the coefficient b). Other things being equal, the smaller the linkage (indicated by lower values for b ; usually $b < 1$), the greater the urgency of promoting indigenous growth within the South through, for example, more South-South trade and greater industrial co-operation, leading to higher levels for a .

The following equation is identical with equation (3) but is in a form that may give a more interesting insight into the sources of the contributions to the attainment of the Lima target:

$$(6) \quad r_1^* = [4.96 + (1 - b) r_2] + br_2$$

The quantity within brackets on the right-hand side of equation (6) represents that part of the Lima target growth rate that has to be met by endogenous growth within the South, and the term br_2 corresponds to the contribution of North-South dependence to the target growth rate. Dividing both sides of the equation (6) by r_1^* yields the same relationship in terms of contribution share of each element:

$$(7) \quad 1 = m_1 + m_2$$

where $m_1 = [4.96 + (1-b)r_2]/r_1^*$ is the share of the endogenous growth factor and $m_2 = br_2/r_1^*$ that of the growth of the developed countries.

It must be noted that the stylized relation between the North and South expressed in equation (4) is only symptomatic of a more complicated economic interdependence. Given the limited industrial maturity of most of the developing countries, high industrial growth in these countries would entail a large and growing demand for capital, intermediate and technical products and skills that at present appear to be forthcoming mainly from the developed countries. The increase in demand for the exports of developed countries is likely to raise the growth rate of their industrial output, a fact that may in turn lead to a reduction in the world industrial output share of developing countries. 3/

On the other hand, the expansion of industrial output in the developing countries may be contingent on a strong demand for these products in the developed countries, which may in turn depend on favourable economic growth in the latter countries.

Data on MVA growth trends by broad economic groupings during the period 1960-1980 are presented in the table. Two regression relationships were estimated using the data in the table to highlight the dependence of the MVA growth rate of the developing countries on that of the developed countries, as follows:

$$(8) \quad r_1 = 5.189 + 0.402r_2 \\ (9.27) \quad (4.175)$$

$$R^2 = 0.492, \text{ D.W.} = 1.124, 1961-1980$$

$$(9) \quad r_1 = 5.3581 + 0.419r_2 \\ (10.61) \quad (4.62)$$

$$R^2 = 0.753, \text{ D.W.} = 0.6915, 1970-1980$$

The regression parameters of the two estimated equations are remarkably similar, suggesting the robustness of the estimates. Not surprisingly, the estimated values of the b coefficients are far smaller than 1: an MVA growth change of one per cent in the developed countries induces less than a half a per cent change in the growth in the developing countries. Thus, if the developed countries' historical MVA growth rate of 4 per cent is assumed to prevail, the corresponding average growth rate for developing countries would be 6.797 per cent using equation (8). But the required growth rate is 8.96 per cent using equation (3), and this gives a Lima growth-rate gap of 2.16 per cent. Furthermore, based on the historical values of the parameters estimated for the period 1960-1980, the endogenous growth factor must generate an average annual growth rate of $[4.96 + (1 - 0.402)4] = 7.352$ per cent (equation 6), and the remainder of $(0.402)4 = 1.608$ per cent comes from the North's growth to realize the Lima growth rate of 8.96 per cent. That means $m_1 = 82$ per cent for the endogenous growth factor and $m_2 = 18$ per cent for the North-South linkage effect.

Given this historical trend, it appears that to achieve the Lima target primarily relying on internally generated growth processes within the South is a formidable challenge. It seems essential, therefore, that a two-pronged assault on closing the Lima gap be launched. On the one hand, every avenue of the North-South co-operation to increase the North-South linkage effect should be exhausted. Some such avenues are these:

(a) Whittling down protectionist barriers and opening up the markets of the developed countries for the manufactured exports of developing countries;

(b) Enlarging financial flows to developing countries; in particular, redirecting far greater proportions of increased external capital flows to the least developed countries;

MVA growth rates by economic groupings, 1960-1980

Year	Developed market economies		Centrally planned developed economies ^{a/}		Developing market economies	
	MVA (billions of dollars)	Growth rate (%)	MVA (billions of dollars)	Growth rate (%)	MVA (billions of dollars)	Growth rate (%)
1960	560				58.61	
1961	583	4.107			63.13	7.718
1962	626	7.376			66.57	5.444
1963	667	6.550	146		70.82	6.386
1964	724	8.546	157	7.51	77.85	9.924
1965	772	6.630	170	8.42	82.80	6.367
1966	823	6.606	183	8.13	87.58	5.769
1967	841	2.187	202	9.94	91.14	4.062
1968	903	7.372	220	8.86	100.06	9.795
1969	968	7.198	237	7.94	109.86	9.796
1970	985	1.756	259	9.30	119.60	8.858
1971	1 013	2.843	281	8.56	129.41	8.204
1972	1 084	7.009	302	7.34	140.87	8.857
1973	1 182	9.041	328	8.79	155.06	10.072
1974	1 166	-1.354	359	9.26	163.65	5.542
1975	1 116	-4.288	391	8.87	168.33	2.857
1976	1 213	8.691	417	6.84	181.54	7.850
1977	1 269	4.617	447	7.12	191.87	5.690
1978	1 306	2.916	473	5.78	204.31	6.485
1979	1 356	3.828	493	4.33	217.31	6.629
1980	1 317	-2.876	515	4.33	224.73	3.154
1960-1970 average		5.83		8.58 (1963-1970)		7.41
1970-1980 average		3.04		7.12		6.53
1960-1980 average		4.43		7.72 (1963-1980)		6.97

Source: United Nations, "Handbook of world development statistics, 1983: Major economic indicators showing historical development trends" (PPS/QIR/5/1983), and UNIDO data base.

^{a/} Refers to Eastern Europe. Since National Accounts data for the years 1960, 1961 and 1962 are not comparable with value added data, this table bypasses MVA data for those years.

(c) Increasing joint ventures and other forms of direct investments in developing countries;

(d) Adopting more liberal policies of technology transfer and accelerating its flow to developing countries;

(e) Abandoning some industrial activities in the developed countries for the benefit of developing countries; that is, pursuing policies of North-South industrial redeployment and implementing required positive industrial adjustment programmes in the North. This holds true particularly for the traditional "smokestack industries", in which the North's comparative advantage has been rapidly eroding.

On the other hand, conscious efforts must be made to generate and sustain endogenous growth processes within the South through increased South-South trade and greater industrial co-operation. A short list of such South-South co-operation could include:

(a) Industrialization in the developing countries, which must cover the whole range of activities, including capital goods production and the improvement of technology, that would increase the "industrial maturity" of the South discussed earlier, thereby lessening the South's dependence on the North for capital and intermediate goods, and technology;

(b) Trade in manufactured products between the developing countries, which must expand to levels capable of exploiting the scale economies of industrial production in these countries;

(c) Trade and aid, which should be co-ordinated to facilitate the adjustment process implied in the Lima target.

As Professor Hans Singer ^{4/} correctly pointed out, developing countries need to improve x-efficiency and planning as an essential part of the changes that must occur before the Lima target can be reached.

The Lima Declaration and Plan of Action envisaged a restructuring of the present world industrial order to redress the existing imbalances in production and consumption between the developed and the developing countries. The target of a 25 per cent share of total world industrial production for developing countries by the year 2000 was considered a minimum requirement to translate this vision into reality. What emerges from this study is the realization that although the target is dependent on the rate of growth of industrial output in developed countries, the so-called "locomotive effect" of the North may not be sufficient to enable the South to reach the target. In fact, recent protracted global recession, a rising tide of protectionism in the North and shrinking export markets for developing countries dim any hope of realizing the Lima target by depending on the North-South linkage. It is increasingly clear that the realizability of the Lima target depends, rather, on the South's ability to accelerate its attainment of industrial maturity by utilizing all opportunities for South-South trade and industrial co-operation.

Notes

1/ Report of the Second General Conference of the United Nations Industrial Development Organization (ID/CONF.3/31), chapter IV, "The Lima Declaration and Plan of Action on Industrial Development and Co-operation", para. 28.

2/ The data are taken from World Industry in 1980: Regular Issue of the Biennial Industrial Development Survey (United Nations publication, Sales No. E.81.II.B.3), p. 29.

3/ A.O. Krueger, "LDC manufacturing production and implications for OECD comparative advantage", Western Economies in Transition: Structural Change and Adjustment Policies in Industrial Countries, I. Levenson and J.W. Wheeler, eds. (Boulder, Colorado, Westview Press, 1979).

4/ H.W. Singer, "Industrialization: Where do we stand? Where are we going?", Industry and Development, No. 12 (United Nations publication, Sales No. E.84.II.B.4).

REGIONAL ENERGY IMPLICATIONS OF THE LIMA TARGET: A TENTATIVE
QUANTITATIVE ASSESSMENT

Secretariat of UNIDO

Introduction and main conclusions

The Second General Conference of UNIDO held at Lima, Peru, in 1975 produced the Lima Declaration and Plan of Action, which Declaration set a target for increasing industrial production in the developing countries "to the maximum possible extent and as far as possible to at least 25 per cent of total world industrial production by the year 2000". 1/ The attainment of this target requires, among other things, fundamental structural changes in production and international trade for both developing and developed countries. The target has also important implications for other sectoral and development issues: agriculture, energy, transport, employment, basic needs and transfer of financial resources and technology to developing countries.

The purpose of this paper is to analyse quantitatively the energy implications of attaining the Lima target. However, the scope of the study goes beyond an assessment of energy requirements for the attainment of the Lima target for the developing countries. The study disaggregates the total energy requirements implied by the Lima target into four components based on a regional share scheme, worked out by the UNIDO secretariat, of the 25 per cent total, which reconciles regional targets agreed on at regional conferences held prior to the Second General Conference of UNIDO. 2/ Furthermore, with an independently estimated energy supply for each region, the study estimates possible energy gaps, i.e. production-consumption imbalances implied by the Lima target, for each region* and for all the developing countries. The study concludes with an analysis of these energy gaps and the serious obstacle they form to the attainment of the Lima target, and recommends the policy measures required to eliminate them, particularly in the context of South-South co-operation.

The growth rate of the gross domestic product (GDP) of the developed countries was set at three different rates between 1980 and 2000, namely 2.5 per cent a year for scenario one (S1), 3.5 per cent for scenario two (S2), and 4.5 per cent for the most optimistic growth scenario (S3). Corresponding to these three scenarios, production-consumption imbalances of commercial energy for all four regions in 2000 were calculated. The Middle East emerges with a sizeable surplus of about 50 million barrels of oil equivalent per day (mboed) under S1 and 29 mboed under S3. By contrast, Latin America's gap may range anywhere from 12 mboed (S1) to 25 mboed (S3), while Asia and the Pacific could suffer a shortfall of 8 mboed

*In this paper country coverage of the four regions is based on regional commission membership.

(S1) to 18 mboed (S3). The energy balance appears promising in Africa with a manageable deficit of 1.5 mboed even under S3.

The financial implications of the energy gap for certain regions are substantial. If the energy prices are assumed to rise by 2 per cent a year to \$41 per barrel by 2000 in real terms, the financing requirements for energy imports for Latin America would be about \$180 billion (10 per cent of GDP) per year at present constant prices under S1, \$269 billion (12 per cent of GDP) under S2, and \$374 billion (14 per cent of GDP) under S3. For Asia and the Pacific, the financing requirements for energy imports would amount to \$120 billion (10 per cent of GDP) under S1, \$180 billion (12 per cent of GDP) under S2, and \$269 billion (15 per cent of GDP) under S3. If the energy price were to rise faster than the assumed rate of 2 per cent per year, the financial implications for these regions might reach alarming proportions. Undoubtedly, no such major energy constraints would emerge in the Middle East, and the same holds true for Africa. However, this aggregate figure may belie the plight of the great majority of the individual oil-importing developing countries, as illustrated by the case of Africa where the lion's share of energy resources and energy production in that region is concentrated in a few countries such as Algeria, Libyan Arab Jamahiriya and Nigeria.

I. Methodology

The critical link between energy and industrialization is too well-known to require elaboration. It suffices to point out that a number of developing countries, particularly newly industrializing countries (NICs), are going through the second phase of industrialization, characterized by the production of energy-intensive intermediate and capital goods, and many more will soon pass from the first phase of industrialization, characterized by the production of labour-intensive and technologically simple goods, e.g. light manufacturing, to the second phase.

It is notable that commercial energy consumption in developing countries is critically related to their GDP growth rates and the rate of structural transformation, which could be measured by the manufacturing value added (MVA) share of GDP as its proxy variable. Of course, the energy prices will also have a significant effect on energy consumption through energy conservation and the use of energy-efficient technology, and their effects will be duly taken into account in projecting commercial energy demand in each region.

The central feature of the methodology used in this paper for energy projection is the GDP elasticity of energy, defined as

$$(1) \quad \epsilon = (\Delta E/E)/(\Delta y/y) = \dot{E}/\dot{y}$$

where E is commercial energy consumption and y is GDP, and the dot (.) above the variable denotes the percentage change. Equation (1) can be rewritten as

$$(2) \quad \dot{E} = \epsilon \cdot \dot{y}$$

from which it is clear that, given the GDP elasticity of energy ϵ , which

can be estimated from historical data, and the GDP growth rates for each region implied by the Lima target, the commercial energy consumption rates \dot{E} required to attain the Lima GDP for each region can be readily estimated. It is important to note that the GDP elasticities estimated from historical data may have to be adjusted downward if they are used for projecting energy consumption. Such downward adjustments may be necessary in the light of anticipated higher energy prices and the development of energy-efficient technology.

Once the energy consumption rate is estimated as above, it is quite straightforward to project regional commercial energy consumption for the Lima target year, 2000, namely:

$$(3) E_T = E_0(1 + \dot{E})^{T-0}$$

where the superscripts T and 0 denote the terminal year and the base year respectively.

A set of mutually consistent regional GDP growth rates required to attain regional targets needs to be determined to estimate regional energy consumption requirements. But since the Lima target and its regional distribution scheme are couched in terms of MVA share, another set of consistent regional MVA growth rates should be derived and a functional relationship between GDP and MVA should be mathematically spelled out so that given the Lima target MVA growth rates, the corresponding GDP growth rates may be readily calculated.

The total energy requirements to meet the Lima target for all the developing countries is obtained by summing up the individual regional requirements. Moreover, an independent estimate of the commercial energy production in each region up to 2000 is derived and compared with regional energy consumption projected for the target year to estimate the production-consumption imbalance in each region and for the world.

A formal model describing the structure of relationships that exist between the economies of different regions and the interface of energy and economic growth is given in annex I. Also presented therein is a step-by-step algorithm for solving the model to yield a set of mutually consistent regional GDP and MVA growth rates corresponding to the three different growth scenarios.

II. Regional growth rates of GDP and MVA

Several key parameters of the model were exogenously determined to generate a set of consistent growth rates of GDP and MVA for each region and the developing countries as a whole, as follows:

(a) The growth rate of GDP in the developed countries was taken at three different rates between 1980, the base year for the calculations, and 2000, the Lima target year. S1 is an average of 2.5 per cent per annum, reflecting the continuation of the current weakened world economic conditions. S2 is 3.5 per cent, taking the lower end of the range of the Third United Nations Development Decade target, which was set between 3.5 per cent and 3.9 per cent. S3 is 4.5 per cent, which envisages a more vigorous growth path of the world economy;

(b) Lima target: $\Pi = 0.25$, i.e., the share of developing countries

in world MVA in the year 2000, divided into regional shares of world MVA in 2000: Latin America, 0.13; Middle East (ECWA region), 0.03; Asia and the Pacific (ESCAP region), 0.07; and Africa (ECA region), 0.02;

(c) The growth rate of MVA share of GDP in the developed countries (\dot{b}^{nm}) was needed to calculate the MVA share of GDP in the developed countries for the year 2000, and hence MVA of the developed countries in 2000, since the GDP of the developed countries in 2000 was already determined by its exogenously given GDP growth rate. The MVA share growth rate was taken as 0.32 per cent per year, a historical growth rate of the 1975-1980 period;*

(d) The growth rate of MVA share of GDP in the developing countries (\dot{b}^{sm}) was necessary to translate the Lima MVA of the developing countries as a whole into its GDP equivalent. This growth rate was set at 1.27 per cent, again an estimate based on the 1975-1980 data. This rate is then disaggregated into the growth rates of MVA share of GDP for each region (\dot{b}_i^{sm}) to determine each region's share of the aggregate GDP of the developing countries (a_i^T) in 2000. These growth rates were estimated from historical data observed in the 1975-1980 period and they are (percentage): Latin America, 0.76; Middle East, 4.48; Asia and the Pacific, 1.48; and Africa, 1.24. Historical data on GDP and MVA by region, their average annual growth rates, each region's MVA share of GDP and regional share of world MVA for the period 1975-1980 are given in annex II.

Table 1 shows the distribution of world GDP by region and country group in accordance with the regional share scheme and the three scenarios described above. Table 2 presents a similar table for MVA, and table 3 summarizes the growth rates required to attain these target GDPs and MVAs. Several interesting points emerge from these computational results. First, the calculated growth rate differential of MVA between developing and developed countries is around 5.5 per cent, ignoring negligible rounding errors. In fact this differential is solely a function of the growth rate determined by an initial value of the share of the developing countries of world MVA and their Lima share (25%), which is denoted by (λ).** Similarly, a constant differential exists between the GDP growth rate of the developing countries and that of the developed countries. But this time the differential is determined by the growth rates of the MVA share of GDP of both developing and developed countries in addition to λ . This constant is roughly equal to 4.6 per cent.***

*Actually, the combined MVA share of GDP for 26 developed market economies has declined from 29.2 per cent in 1973 to 27.5 per cent in 1980 according to UNIDO data. Therefore, the positive growth rate in the MVA share of GDP shown for the developed countries as a whole during the period 1975-1980 was mainly due to the MVA share growth in the centrally planned countries in East Europe.

**From equation (20a) in the annex, $\dot{r}^{sm} = \dot{\lambda} + \dot{r}^{nm}$ and $\dot{\lambda} = 0.005$.

***From equation (20b) in the annex, $\dot{r}^s = \dot{\lambda} + (\dot{b}^{nm} - \dot{b}^{sm}) + \dot{r}^n$ and $\dot{\lambda} + (\dot{b}^{nm} - \dot{b}^{sm}) = 0.046$.

Table 1. GDP by region and group, 1980 and 2000

Region or group	1980		2000			
	Amount (billions of 1975 dollars)	Fraction of world total (%)	Amount predicted by scenarios (billions of 1975 dollars)			Fraction of world total (%)
			S1	S2	S3	
World	6 967.3	100	14 043	17 052	20 668	100
Developed countries	5 867.0	84.21	9 614	11 674	14 150	68
Developing countries	1 100.3	15.79	4 429	5 378	6 519	32
Latin America	472.3	6.78	1 842	2 237	2 712	13
Middle East	120.6	1.73	638	774	938	4.5
Asia and the Pacific	327.7	4.70	1 191	1 446	1 753	8.5
Africa	179.7	2.58	758	921	1 116	5

Source: See table 13, annex II.

Table 2. MVA by region and group, 1980 and 2000

Region or group	1980		2000			
	Amount (billions of 1975 dollars)	Fraction of world total (%)	Amount predicted by scenarios (billions of 1975 dollars)			Fraction of world total (%)
			S1	S2	S3	
World	2 034.55	100	4 252	5 163	6 258	100
Developed countries	1 825.78	89.73	3 189	3 872	4 693	75
Developing countries	208.77	10.26	1 063	1 291	1 564	25
Latin America	212.93	5.99	553	671	814	13
Middle East	10.05	0.49	128	155	188	3
Asia and the Pacific	61.07	3.00	298	361	438	7
Africa	15.74	0.77	85	103	125	2

Source: See table 13, annex II.

Table 3. GDP and MVA annual growth rates by region, 1980-2000
(Percentage)

Region or group	1975-1980	GDP			1975-1980	MVA		
		S1	S2	S3		S1	S2	S3
World	3.70	3.57	4.58	5.59	4.03	3.75	4.77	5.78
Developed countries	3.50	2.50	3.50	4.50	3.82	2.83	3.83	4.83
Developing countries	4.78	7.21	8.26	9.30	5.97	8.48	9.54	10.59
Latin America	4.88	7.04	8.09	9.13	5.00	7.85	8.90	9.95
Middle East	6.40	8.68	9.74	10.80	9.27	13.55	14.66	15.76
Asia and the Pacific	3.74	6.66	7.70	8.75	7.76	8.24	9.30	10.35
Africa	5.47	7.46	8.51	9.56	5.19	8.80	9.86	10.92

Source: Calculated from tables 1 and 2.

Furthermore, it should be noted that the growth rate of MVA exceeds that of GDP by a constant differential for each region and country group and this differential is solely determined by the rate of change of structural transformation in each region as given by the growth rate of MVA share of GDP (b^{sm}).^{*} Of course, the rate of change of structural transformation may vary considerably from one region to another. For instance, it ranged from 0.11 per cent for Latin America to 2.7 per cent for the Middle East in the period 1975-1980. For the period 1980-2000, these differentials between MVA and GDP growth rates are projected to be (percentage): 0.80 for Latin America, 4.5 for the Middle East, 1.5 for Asia and the Pacific, 1.3 for Africa and 1.3 for the developing countries as a whole. As a result, the most rapid structural change is expected in the Middle East and the least rapid in Latin America. This observation seems plausible in view of the fact that a massive industrialization drive has recently been launched from a base of nearly zero and accelerated in the Middle East (particularly in the Gulf States), fuelled by an abundant surplus of petro-dollars. However, most of the economies in Latin America have moved far along the path of industrialization and any further industrial progress is likely to encounter increasingly difficult financial and resource constraints.

In a similar vein, the growth rates of GDP and MVA in the Middle East may appear somewhat optimistic but by no means unattainable in the absence of key twin constraints to industrialization: financial capital and energy. The same may not, however, hold true for Africa. Given the

^{*}From equation (13) in the annex, $r_i^{sm} = b_i^{sm} + r_i^s$.

gravity of fundamental economic and structural problems confronted by Africa, it may take herculean co-operative efforts both at the domestic and international scene to raise Africa's MVA of about \$6 billion in 1980 to the Lima target range of \$85 billion to \$125 billion in real terms and to increase its 1980 GDP four-to-six-fold in the coming two decades. On the other hand, the GDP and MVA growth rates required to attain the regional Lima targets in Latin America and Asia and the Pacific appear to be well within the range of possibility, although the attainment of such regional targets under the most optimistic scenario S3 may prove to be very difficult.

Finally, tables 1 and 2 show that the attainment of the regional Lima target shares for manufacturing output implies a greater increase in the share of GDP.* Thus, for example, Africa's MVA in 2000 is 2 per cent but its GDP share is 5.4 per cent, Latin America's MVA share is 13 per cent with its GDP share as 13.12 per cent, Middle East's MVA share is 3 per cent with its GDP share as 4.54 per cent, and Asia's MVA share is 7 per cent with its GDP share as 8.48 per cent. In aggregate, the developing countries' total of 25 per cent of world MVA is accomplished by a 31.54 per cent share of world GDP.

It is obvious that the regional growth rates of GDP and MVA calculated above are sensitive to the regional share scheme of world MVA adopted, apart from the postulated GDP growth rate of the North. It appears that the regional MVA share used in the above calculations may overestimate the growth capacity of Latin America and the Middle East and underestimate that of Asia and the Pacific, particularly in view of the recent phenomenal growth performance of several newly industrializing countries (NICs) in that region. The Asia and the Pacific region may continue to be one of the most dynamic growth poles in the world for a long time to come. In the meantime, severe skilled manpower shortages and technological constraints may stand in the way of the Middle East's efforts to raise its 1980 share of world MVA of less than half a per cent to 3 per cent by the year 2000. It may be also somewhat unrealistic to expect that Latin America will increase its 1980 share of world MVA of 6 per cent more than two-fold in the next two decades in the light of the serious structural and financial problems confronted by the region. Reflecting these factors, an alternative share scheme was devised whereby Latin America's share was reduced to 11 per cent and that of the Middle

*Mathematically, we have to show that the ratio variable $k = (y_i/y_w)/(y_i^m/y_w^m)$, where y_i and y_i^m are the i -th region's GDP and MVA respectively, and y_w and y_w^m are world GDP and MVA, is greater than 1. Noting $y_w = y_n + y_s$ and $y_w^m = y_n^m + y_s^m$, and after a series of substitutions and rearranging terms, a final form of the inequality can be expressed as $k = (b_i^{nm} b_i^{sm} + b_i^{nm} b_i^{sm} \lambda) / (b_i^{sm} b_i^{sm} + b_i^{sm} b_i^{nm} \lambda) > 1$ or $(b_i^{nm} - b_i^{sm}) b_i^{sm} + (b_i^{sm} - b_i^{nm}) b_i^{nm} \lambda > 0$. Therefore, the inequality holds if $(b_i^{nm} - b_i^{sm}) > 0$ and $(b_i^{sm} - b_i^{nm}) > 0$. If $(b_i^{sm} - b_i^{nm}) < 0$, then the inequality holds when the value of the first term is greater than that of the second term.

East to 2 per cent, and an off-setting increase of Asia and the Pacific's share to 10 per cent, leaving Africa's share unchanged. GDP and MVA calculations based on such an alternative distribution with the assumption of a 3.5 per cent growth rate for the developed countries are shown in table 4.

It comes as no surprise that a new MVA distribution scheme reduced the MVA growth rate of Latin America slightly from 8.9 per cent to 8 per cent, since the MVA share of GDP in Latin America was postulated to grow only by 0.76 per cent per year in the period 1980-2000, as described earlier. This is equivalent to the reduction of growth rate by less than one percentage point for two percentage points decrease in its share of world MVA. In contrast, the MVA share of GDP in the Middle East was assumed to increase by about 4.5 per cent per year in the same period and this factor was sensitively reflected in the reduction of MVA growth rate by almost two percentage points for one percentage point drop in its share of world MVA. Nevertheless, the new MVA growth rate of 12.35 per cent for the Middle East is still the highest in the world, surpassing that of the Asia and the Pacific region, which was calculated to be 11.36 per cent. Overall, new growth rates obtained under an alternative scheme, both GDP and MVA, appear more reasonable and plausible than those calculated under the first assumption.

III. Regional energy requirements and energy gaps

The two most critical factors in determining aggregate commercial energy consumption are the pace of economic growth and the way in which energy consumption responds to varying economic activities after properly allowing for the effect of changing energy prices on energy consumption.* The first variable is usually measured by the GDP growth rate and the second by the GDP elasticity of energy consumption adjusted for the energy price effect. In the previous section of the paper, GDP growth rates for each region implied by the three scenarios were calculated. The missing element needed to determine regional energy consumption levels consistent with the attainment of regional Lima targets is the estimation of GDP elasticities of energy.

Table 14 in annex II shows the data for commercial energy consumption that provided the basis for computing GDP elasticities of energy for each region and group given in table 5. It is particularly interesting to note a marked difference in the aggregate GDP elasticity of energy between developing and developed countries during the same period in which the second energy price shock occurred before the ripple effects of the first shock had subsided. It appears that the developed countries as a whole responded remarkably to sharply escalating energy prices through conservation and efficient energy management, although part of the decline in the GDP elasticity of energy to 0.61 in developed countries could be explained by the relatively sluggish performance of the world economy.

*In addition to income and energy price, there are other factors affecting energy consumption such as a country's resource endowments, level of technical and economic efficiency, and government policies.

Table 4. Regional MVA and GDP growth under an alternative regional share scheme, year 2000

Region or group	GDP				MVA			
	Amount		Growth rate (%)		Amount		Growth rate (%)	
	(billions of 1975 dollars) Reference	Alternative	Reference	Alternative	(billions of 1975 dollars) Reference	Alternative	Reference	Alternative
World	17 052.4		4.58		5 163.1	5 163.1	4.77	
Developed countries	11 674.1		3.50		3 872.3	3 872.3	3.83	
Developing countries	5 378.3		8.26		1 290.8	1 290.8	9.54	
Latin America	2 237.37	1 893.16	8.09	7.19	671.20	567.94	8.9	8.0
Middle East	774.48	510.94	9.75	7.49	154.89	103.26	14.66	12.35
Asia and the Pacific	1 445.69	2 054.51	7.70	9.61	361.42	516.31	9.30	11.36
Africa	920.76	920.76	8.51	8.51	103.26	103.26	9.86	9.86

Notes: 1. The GDP growth rate of the developed countries is set at 3.5 per cent.

2. Regional MVA shares (percentage):
Reference: Latin America, 13; Middle East, 3; Asia and the Pacific, 7; Africa 2;
Alternative: Latin America, 11; Middle East, 2; Asia and the Pacific, 10; Africa, 2;
1980 share: Latin America, 6; Middle East, 0.49; Asia and the Pacific, 3; Africa, 0.77.

Table 5. GDP elasticity of energy use

Region or group	1975-1980	1980-2000
Developed countries	0.61	0.55
Developing countries	1.44	1.12
Latin America	1.33	1.10
Middle East	1.71	1.40
Asia and the Pacific	1.44	1.10
Africa	2.20	1.20

Source: See table 14, annex II.

In contrast, the growth of commercial energy consumption outpaced GDP growth in the developing countries, yielding an elasticity of 1.44, despite high energy costs and severe balance-of-payment difficulties encountered in the same period. Major underlying factors contributing to this strong upsurge in commercial energy consumption in the developing countries, notwithstanding rapidly rising energy prices, were higher population growth, more rapid economic growth, acceleration of urbanization, structural changes involving the development of more energy-intensive industries, and replacement of traditional energies by commercial energy.

Within the South, the elasticity varied remarkably from region to region. First, the extremely high elasticity value for Africa (2.20) may be considerably overstated, mainly because of a statistical anomaly where the growth rate has to be calculated from an extremely low base, namely 0.7 mboed in 1975, which grew to 1.21 mboed by 1980, thus yielding an average annual growth of 12 per cent. It is highly likely that the growth rate of commercial energy consumption in Africa would decrease substantially as the quantity of commercial energy consumption steadily increases, and so the elasticity would drop. In the meantime, the relatively high elasticity value for the Middle East (1.71) may appear quite reasonable in the light of an intensified drive for energy- and capital-intensive industrialization, and the unrestrained energy consumption patterns encouraged by the abundant energy supply in the region. The elasticity values for Asia and the Pacific and Latin America are plausible. In fact, the value for Asia and the Pacific is exactly the same as the mean value for the developing countries as a group, and that of Latin America deviates only slightly from it.

Given these historically observed elasticities, the critical question remains as to what elasticities are to be used for projecting commercial energy consumption up to the year 2000 in different regions. As underscored earlier, the way energy-use patterns change depends on many factors other than GDP, and a particularly important factor is the energy price. A priori, it is clear from economic theory that the effects of income and price work in opposite directions. But the great uncertainty is the rel-

ative dominance of the two effects and the quantitative magnitude of the net effect. Ideally, an elaborate econometric model of energy consumption could enable us to isolate the price effect from the income effect and thus help to estimate the relative quantitative importance of the two effects. 3/ Short of such a modelling exercise, there seems to be no alternative but to reflect the effects of price on energy use indirectly through adjustments to the GDP elasticity of energy use. Such judgementally adjusted regional elasticity values for the period 1980-2000 are given in table 5. It may be useful to explain how each of these estimates was arrived at. The most critical assumption underlying these estimates was that the real energy prices would continue to rise steadily within a range of one to three per cent per annum in the next two decades. Given that energy price trajectory, it was further assumed for the developed countries as a group that the energy-efficient consumption patterns established in the 1970s would continue to improve through better conservation, development of energy efficient technology and structural transformation to less energy-intensive high-technology and specialized service industries away from the traditional energy-intensive "smokestack industries", such as petrochemicals and basic metals. As a result, the GDP elasticity of 0.61 during the period 1975-1980 was scaled down to 0.55, reflecting the energy-saving factors mentioned above in response to an anticipated continuous but relatively modest rise in the real energy costs over the next two decades.

It is expected that the Middle East will continue to concentrate on the development of energy-intensive industries, exploiting its comparative advantages, namely, abundant cheap energy and surplus capital. These considerations are fully reflected in a relatively high elasticity value assigned to this region (1.4), but it is appreciably lower than its historical value of the 1975-1980 period (1.71), recognizing the increasing importance of energy-saving measures even in energy-rich countries as the opportunity cost of energy wastes rises rapidly. For Africa, a more drastic downward adjustment from the 1975-1980 historical level (2.2) was made with an assumed elasticity value of 1.2. This was partly justified because the elasticity calculated from the 1975-1980 data may tend to overestimate its true value for the reasons explained earlier. Even if the estimate is close to its true value, it is highly unlikely that the extremely high rate of energy consumption implied by the past data could be sustained over the next two decades, mainly because of inadequate financial resources and limited technological and productive capacities in Africa.

Given a relatively broad industrial base and considerable technological capabilities in Latin America and Asia and the Pacific, it is assumed that the two regions would be better poised to respond effectively to the problems of industrialization with high energy costs if they adopted energy-efficient technology and implemented vigorous energy conservation programmes. The relatively low value of elasticity given to these regions (1.1) may reflect the structural flexibility of the regions to cope with energy problems emerging from the process of accelerated industrialization.

A weighted average of four regional elasticities would yield an average elasticity for the developing countries as a whole equal to 1.12, which seems quite reasonable, if not underestimated. In aggregate, the response of commercial energy consumption in developing countries to their GDP growth may continue to be more proportionate than in the past, in view of the accelerating trends for population growth, urbanization, energy-intensive industrialization and the substitution of commercial for non-commercial energy in developing countries, but be considerably restrained by the rising energy costs over the next two decades.

Summarized in table 6 are the regional growth rates of commercial energy consumption, which were obtained by multiplying the GDP elasticities of energy by the GDP growth rates generated by the three scenarios. It is particularly noteworthy that despite the fact that the elasticity values for all regions were deliberately set on the conservative side of a possible range of estimates all substantially below the actual value observed during the period 1975-1980, the growth rates of energy consumption in all regions but the developed countries are still markedly high relative to their past trend values. It is, however, clear that these high energy consumption rates are influenced not so much by the GDP elasticities as the required GDP growth rates implied by the Lima target (see table 3). But, overall, they are still well within the realm of attainability and this may be the case particularly for those values associated with S1 and S2. The projected commercial energy consumption for each region in the year 2000 corresponding to the growth rates given in table 6 is summarized in table 7. As expected, the commercial energy consumption of the developing countries as a whole needed to attain the Lima target is quite substantial, requiring almost five times the level of 1980 consumption under S1, slightly over six times under S2, and almost eight times

Table 6. Annual growth rates of commercial energy consumption
(Percentage)

Region or group	1975-1980	1980-2000		
		S1	S2	S3
World	2.61	2.66	3.46	4.31
Developed countries	2.13	1.38	1.93	2.48
Developing countries	6.89	7.91	9.28	10.73
Latin America	6.47	7.74	8.90	10.04
Middle East	10.96	9.52	13.64	15.12
Asia and the Pacific	5.40	7.33	8.47	9.63
Africa	12.06	8.95	10.21	11.47

Table 7. Commercial energy consumption by region and group, 1980 and 2000 (mboed)

Region or group	1980	2000		
		S1	S2	S3
World	107.40	181.62	215.12	249.92
Developed countries	95.04 (88.49)	125.01 (68.83)	139.16 (64.69)	155.13 (62.07)
Developing countries	12.34 (11.49)	56.61 (31.17)	75.96 (35.31)	94.79 (37.93)
Latin America	5.35 (4.98)	23.76 (13.08)	29.44 (13.69)	36.25 (14.50)
Middle East	1.11 (1.03)	6.84 (3.77)	14.32 (6.66)	18.55 (7.42)
Asia and the Pacific	4.67 (4.35)	19.29 (10.62)	23.74 (11.04)	29.37 (11.75)
Africa	1.21 (1.13)	6.72 (3.7)	8.46 (3.93)	10.62 (4.25)

Note: Figures in parentheses are percentage shares of the world total.

under S3. Equally dramatic is an increase in the share of the developing countries in world energy consumption, rising sharply from 11.5 per cent in 1980 to about 31 per cent under S1, 35 per cent under S2 and 38 per cent under S3.

There are also significant regional variations in the energy requirements implied by the Lima target, with the Middle East showing the fastest growth of energy consumption. However, the regional growth and relative shares of energy consumption are sensitive to the scheme for distributing the Lima target by region, which was found earlier to affect significantly the relative growth rates of GDP and MVA among regions (table 4). Table 8 illustrates such a case. More specifically, regional energy requirements in the year 2000 and their annual growth rates over the period 1980-2000 are compared with the original share scheme and an alternative version, assuming the GDP growth rate of the North to be 3.5 per cent. For the Middle East, a reduction of its MVA share by one third results in a fall of 50 per cent in its energy requirements, reducing its annual growth rate from 13.6 per cent to 10.5 per cent, a remarkable change. Similarly, there is a drop for Latin America, although it is less pronounced. Asia

and the Pacific, on the other hand, registers an offsetting gain. Africa remains unchanged, since its share is kept intact. This example merely underscores the importance of a regional MVA distribution scheme as a critical parameter in deriving regional energy implications of the Lima target as well as other policy implications at the regional level.

So far, concentration has been on the demand side of the energy picture, namely, calculating the level of commercial energy consumption required to attain the Lima target in each region. By now, it is, however, apparent that the most interesting variable is not the level of energy requirements *per se*, but a shortfall or surplus of commercial energy that may develop in each region, given the structure of regional energy demand determined by the Lima target. This production-consumption gap is denoted hereafter as the Lima energy gap. It is, therefore, necessary to project commercial energy production in each region up to the year 2000 to estimate regional Lima energy gaps.

Table 8. Regional energy requirements under an alternative regional share scheme

Region	1980 (mboed)	2000 (mboed)		Average annual growth rate 1980-2000 (%)	
		Reference	Alternative	Reference	Alternative
Latin America	5.35	29.44	24.52	8.90	7.91
Middle East	1.11	14.32	7.35	13.64	10.49
Asia and the Pacific	4.67	23.74	34.84	8.47	10.57
Africa	1.21	8.46	8.46	10.21	10.21

Notes: 1. The GDP growth rate of the North is set at 3.5 per cent.

2. Regional MVA shares (percentage):

Reference: Latin America, 13; Middle East, 3; Asia and the Pacific, 7; Africa, 2;

Alternative: Latin America, 11; Middle East, 2; Asia and the Pacific, 10; Africa, 2;

1980 Share: Latin America, 6; Middle East, 0.49; Asia and the Pacific, 3; Africa, 0.77.

An analytically sound approach to the projection of regional energy production usually involves a detailed and comprehensive survey of commercial energy endowments by different sources in each region and an assessment of their maximum production capacities over time that are feasible within general social, economic and technological constraints. Such an in-depth study is beyond the scope of this paper. Instead, this study relies on a simple extrapolation of recent trends with proper allowance

being made for each region's known reserves of selected commercial energy and possible production bottle-necks.

The average annual growth rates of commercial energy production by region during the periods 1970-1980 and 1980-2000 are given in table 9; those of the 1980-2000 period primarily reflect the continuation of the growth rates of the period 1970-1980 with these exceptions:* in Asia and the Pacific, the trend growth rate was corrected for a sharp fall in the oil production of the Islamic Republic of Iran by about 4 mboed between 1978 and 1980 by assuming that the oil production of the Islamic Republic of Iran would be restored to the 1978 level. In Africa, the trend growth rate of less than 1 per cent was raised to 2 per cent in view of the region's considerable development potentials of various sources of energy, including hydro, and recent intensified efforts in the region, both domestic and international, to accelerate their development.

Table 9. Growth of commercial energy production by region and group, 1970-1980 and 1980-2000

Region or group	1980	2000	Average annual growth rate 1970-1980 (%)	Average annual growth rate 1980-2000 (%)	Cumulative production 1980-2000 (billions of barrels of oil equivalent)
	(mboed)				
Developed countries	80.74	132.30	2.45	2.5	1 259.54
Developing countries	37.28	89.01	2.80	4.4	420.46
Latin America	7.62	11.32	1.89	2.0	67.59
Middle East	17.87	57.31	5.88	6.0	239.96
Asia and the Pacific	5.66	11.26	-0.91	3.5	58.42
Africa	6.14	9.12	0.78	2.0	54.49

Source: See table 15, annex II.

Using the growth rates derived above, each region's energy production in the year 2000 was projected. Commercial energy production for the developing countries as a whole more than doubles between 1980 and 2000. Furthermore, there are marked variations in the regional production between 1980 and 2000, ranging from less than a two-fold increase in Latin America and Africa, slightly over a two-fold increase in Asia and the Pacific, and over a three-fold jump in the Middle East.

*The energy supply response would definitely be influenced by its excess demand pressure and consequent rising energy prices. It would, therefore, be more realistic to adjust the extrapolated growth rates of energy production according to the different growth rates of energy use implied by the three scenarios. But without a formal model of supply and demand in the energy market, it would be extremely difficult to quantify the supply adjustment in response to the excess demand pressure.

To make a rough check on the reasonableness of the production figures estimated above, the cumulative production totals for all regions up to the year 2000 were calculated and compared against their currently known reserves of selected commercial energies. Such reserve figures for oil, natural gas and coal are given in table 10. Since geographic grouping in table 10 does not coincide with the Lima regional grouping given in table 9, care must be taken in reading these figures. In particular, Northern Africa's portion of the combined reserve figures for Northern Africa and Western Asia should be transferred to Africa's reserves to make the two tables comparable. Similarly, reserve figures for the Indian subcontinent and East Asia could be combined to yield roughly equivalent reserves in Asia and the Pacific. After making such appropriate adjustments, it becomes clear that the cumulative production totals estimated in table 9 are well within the combined reserve limits of the three commercial energy sources shown in table 10. There is no doubt that the actual total reserves could be considerably greater when other sources of commercial energy such as hydro are included in the reserve estimation. In short, the regional growth rates of energy production specified above seem reasonable, if not underestimated.

Table 10. Selected commercial energy reserves in the developing countries, 1980
(Billions of barrels of oil equivalent)

	Oil	Natural gas	Coal	Total
Latin America	58	24.91	53	136
Africa, Southern Sahara	20.6	7.22	34	62
Northern Africa and Western Asia	403.0	156.07	5	564
Indian Subcontinent	2.8	6.09	163	172
East Asia	14.4	8.40	10	33
Developing countries, total	499	202.69	265	967
World	655	442.47	3 032	4 129

Sources: 1981 Yearbook of World Energy Statistics (United Nations publication, Sales No. E/F. 82.XVII. 16). Oil and natural gas figures from Statistical Review 1980 (Energy Economics Research Ltd.). Coal figures from World Energy Resources 1985-2020, Reports to the World Energy Conference (1978).

The Lima energy gap can be readily calculated for each region from the two separate estimates of production and consumption of commercial energy in the year 2000. Table 11 summarizes production-consumption imbalances corresponding to the three scenarios for all four regions in the year 2000. It is not surprising to find that the Middle East emerges with a sizeable surplus of about 50 mboed under S1 and 30 mboed even under the most optimistic scenario, S3. By contrast, both Latin America and Asia and the Pacific are likely to encounter serious stumbling-blocks in the form of energy shortfalls in the path of industrialization prescribed by the Lima target. In the meantime, the energy balance may appear promising in Africa with a manageable deficit of 1.5 mboed showing only under the

optimistic growth scenario. However, this aggregate figure may reflect the plight of most countries in Africa, since the lion's share of energy resources and energy production in this region is possessed by a handful of countries such as Algeria, Libyan Arab Jamahiriya and Nigeria. Equally misleading is the balance sheet for the developing countries as a whole because of the dominant surplus position of the Middle East.

Table 11. Commercial energy production-consumption gaps by region and group (mboed)

Region or group	1980	2000		
		S1	S2	S3
World	10.64	39.69	6.19	-28.62
Developed countries	-14.30	7.29	-6.86	-22.83
Developing countries	24.94	32.40	13.05	-5.79
Latin America	2.27	-12.44	-18.12	-24.93
Middle East	16.76	50.47	42.99	38.76
Asia and the Pacific	0.99	-8.03	-12.48	-18.11
Africa	4.93	2.40	0.66	-1.50

Sources: Tables 7 and 9.

In the meantime, the energy balance for the developed countries as a whole seems to shed some light on the nature of interactions between the income effects and the price effects mentioned earlier. Under the low growth scenario S1, the effects of energy conservation and improved energy use efficiency, a phenomenon that has become increasingly important since the energy price-hikes in 1973, continue to dominate the growth-induced increase in energy demand. As a result, the supply shortfall of about 14 mboed in 1980 will turn into a surplus of slightly over 7 mboed by 2000. But under the higher growth scenario S2, the growth-induced factor in the energy demand will overtake the forces of conservation and efficiency and result in a negative production-consumption gap of about 7 mboed in 2000, and this gap will be further widened to approximately 23 mboed under the more vigorous growth scenario S3.

Looking at the global production-consumption balance figures, it is apparent that the figures presented in table 11 are a rough approximation to the production-consumption gaps that are most likely to develop in different regions of the world by 2000. This is because no global disequilibrium between production and consumption can be sustained over time; it is bound to generate upward or downward pressures on energy prices, and hence production and consumption adjustments, until an equilibrium between supply and demand at the global level is established. However, without the aid of a simulation model of the global energy markets, which allows for production and trade between regions, it would be almost impossible to arrive at a set of regional energy production and consumption values consistent with a global equilibrium level of output.

Until now, one of the most important developing countries in terms of the quantity of commercial energy consumed and produced, China, was left out of the picture mainly because of the unavailability of China's MVA data needed for computing its MVA growth rates required to attain its share of the Lima MVA. Nevertheless, the exclusion of China from an analysis of energy problems in the developing countries could seriously distort the overall energy balance of the developing countries, and of the world, since China accounted for more than 7 per cent of the world commercial energy consumption (8 mboed) in 1980 and its share of world production amounted to about the same percentage (8.5 mboed) in the same year, as shown in table 12. It is, however, worth noting that China's production has kept pace with its consumption with a net result of a near zero balance in the period 1970-1980 (see table 12). Therefore, to the extent that this production-consumption equality continues to prevail in China during the Lima target period, the basic results obtained earlier regarding the regional energy implications of the Lima target could remain invariant whether or not China is included as a part of the study group. Of course, when it comes to the issue of South-South co-operation on energy to facilitate the attainment of the Lima target, China could play a vital role in view of its rich energy resource endowments and its significant share of world commercial energy consumption. This would be one of many points to be elaborated in the following section on policy implications.

IV. Policy implications

The conclusions and policy implications drawn from this analysis are valid only for the particular values specified for various key parameters of the model such as regional share of world MVA in the year 2000, the growth rate of the North, the rate of structural transformation, GDP elasticity of energy and the growth rate of energy production. An alternative set of these parameters may produce different results, and perhaps variant conclusions and policy implications. This limitation has to be kept in mind in analysing the following results.

First, the financial implications of the energy gap for certain regions, particularly Latin America and Asia and the Pacific, are staggering. Suppose for simplicity that the crude oil price is a reasonably accurate barometer of the general energy price movements and its real price rises at a modest rate of 2 per cent per year from \$29 per barrel in 1983 to \$41 per barrel by 2000. Then, a 12 mboed shortfall in Latin America under S1 means it needs foreign exchange of about \$180 billion (10 per cent of GDP) per year in today's constant prices to import energy needed to realize the Lima target. An equivalent financial deficit on account of energy imports alone for Latin America would balloon to \$269 billion (12 per cent of GDP) under S2, and to a whopping \$374 billion (14 per cent of GDP) under S3, all measured in today's constant prices. In Asia and the Pacific, the same story holds true but on a somewhat smaller scale. The financing needs of energy imports for Asia and the Pacific amount to \$120 billion (10 per cent of GDP) under S1, \$180 billion (12 per cent of GDP) under S2, and \$269 billion (15 per cent of GDP) under S3 in the 1983 prices. It must be stressed that these financing requirements of energy imports are projected on the assumption that the energy prices will increase at a slower pace of 2 per cent per annum in real terms. If the energy prices should rise faster, which may be likely in the light of the

Table 12. Total final consumption and production
of commercial energy in China, 1970-1980

Item	Amount (thousands of tonnes of oil equivalent)				Average annual growth rate (%)		
	1970	1975	1978	1979	1980	1970-1975	1975-1980
<u>Consumption</u>	204 796 (4.10)	302 645 (6.07)	397 670 (7.98)	408 084 (8.18)	399 424 (8.01)	8.12	5.71
Share of world total	4.92%	6.43%	7.60%	7.53%	7.46%		
<u>Production</u>	206 445 (4.14)	318 145 (6.38)	418 277 (8.38)	430 012 (8.62)	422 616 (8.47)	9.03	5.84
Share of world total	4.51%	6.16%	7.33%	7.18%	7.18%		7.43
<u>Production-consumption gap</u>	1 649 (0.04)	15 500 (0.31)	20 607 (0.40)	21 928 (0.44)	23 192 (0.46)		

Source: 1981 Yearbook of World Energy Statistics (United Nations publication, Sales No. E/F.82.XVII.16).

Note: Numbers in parentheses are expressed in millions of barrels of oil equivalent per day (mboed).

current fragile demand-supply balances in the oil markets, as many experts predict, the financial implications could be alarming. For instance, assuming a 4-per-cent increase a year of the real energy price, which is not entirely an unrealistic assumption, the real energy price will rise to \$56.45 per barrel by 2000, 1.37 times the price level attained by a 2 per cent per annum increase, and hence would swell oil import bills in Latin America by the same factor, ranging from \$247 billion (13 per cent of GDP) per year under S1 to \$515 billion (19 per cent of GDP) a year under S3.*

Whatever assumptions are made with regard to the course of energy price movements, low or high, the resultant financing requirements of energy imports for the attainment of the Lima target are likely to be highly problematic in most regions of the South with the major exception of the Middle East, and this energy financing problem will be acutely felt particularly in Latin America, and Asia and the Pacific. The energy shortfall could indeed pose a key constraint to the realization of the Lima target in these regions, apart from other priority problems such as industrial financing, strengthening technological capacities and human resource development. It is particularly disquieting to note that the current extremely pressing debt problems faced by many developing countries in Latin America and some in Asia and the Pacific could be exacerbated as the energy gaps of these countries widen in the course of their drive towards the Lima target. Thus, the balance-of-payments problems induced by energy imports and accompanying mounting debt burdens are critical all the way to the attainment of the Lima target.

There is, obviously, an urgent need for formulating effective policy measures to remove this energy obstacle in the Lima industrialization path. The question is how these energy gaps could be eliminated or at least narrowed to a manageable proportion. The following are some promising but untested ideas on mitigating the energy problems faced by the developing countries in their endeavour to accelerate their industrialization.

Basically the energy production-consumption gap could be narrowed by a two-pronged attack on both demand reduction and supply expansion. On the demand side, there is considerable scope for conservation and efficient energy management, especially in the industrial sector, which is the most important user of commercial energy in the developing countries. It must, however, be ensured that energy conservation is not achieved at the expense of economic growth. Despite the importance of energy conservation in the developing countries, the major burden of bridging the energy gap may have to fall on the supply side.

*As stressed earlier, the energy gaps derived under the high-growth scenarios and particularly S3 may tend to overstate their true magnitudes, when the price effects on supply as well as demand are fully taken into account. With increasing energy shortages, the rate of increase in the real energy prices may exceed the assumed rate of 2 per cent a year in the first case or 4 per cent a year in the second case. As a result, energy consumption will increase slower and at the same time energy production will increase faster than at the rates assumed in the study.

The regional energy balance sheet of table 11 stresses, inter alia, the urgency for close co-operation between the Middle East and the rest of the South. The Middle East will likely have a fairly large positive balance, a surplus more than enough to make up for the energy deficiencies of the rest of the South. It would, however, be unrealistic and even naive to expect that the surplus energy of the Middle East will automatically be transferred to the deficit regions of the South without a concomitant drastic improvement in the financial resources of the deficit regions to import energy therefrom. For any co-operative scheme between the Middle East and the remaining regions of the South to be viable, it must be based on the idea of mutual benefits. Therefore, what is most needed is an imaginative and bold plan for an interregional industrial complementation scheme based on the quid pro quo arrangements of trade and production between regions. For instance, developing countries in Latin America and Asia and the Pacific would guarantee a secure market for the Middle East's exports of fledgling energy-based industrial products in which they have a comparative advantage, such as petrochemicals and other intermediate goods. Furthermore, these two regions where all industrially advanced developing countries are situated could provide technology and a wide range of capital goods needed for the energy-based industrialization of the Middle East. In return, the Middle East could guarantee an assured supply of energy needed to attain the Lima target in the two regions.

In the meantime, a different form of industrial co-operation may have to be mapped out for Africa, mainly because of its embryonic stage of industrialization with abundant supply of labour at low wages. In consideration of factor intensity and resource endowments, Africa may be suited to the development of labour-intensive industries, shifting locational incidence of production of labour-intensive goods from the more developed countries in Latin America and Asia to low-income countries in Africa, a form of South-South industrial redeployment. Under such a scheme, Latin America and Asia would export to Africa the capital goods and technology needed for the build-up of basic infrastructure and an industrial base and the Middle East would provide the necessary energy, financial capital and intermediate goods. This could take the form of a tripartite joint venture with the Middle East providing the finance and energy, Latin America and Asia the capital goods and technology, and Africa the labour and raw materials. Furthermore, it is essential that rapidly industrializing developing countries in the Middle East, Latin America and Asia should provide expanded market opportunities for labour-intensive goods produced in Africa.

The concept of a tripartite co-operative scheme involving the energy-rich Middle East, industrially advanced Latin America and Asia, and the low-income countries of Africa - should go beyond an industrial complementation scheme as described above and be extended to the expansion of various forms of energy sources in all regions. In this context, capital-surplus countries in the Middle East could participate in the exploration, exploitation, and production of all sources of commercial energy. To this end, it is imperative to establish a proper mechanism for facilitating the investments of countries with capital surplus in energy development in all regions. Envisaged is something comparable to the Energy and Mines Guarantee Fund proposed by the Inter-American Bank to ensure both equity and debt financing against political risks and specific financial and commercial risks. Furthermore, a more automatic mechanism

for recycling a portion of petro-dollar surpluses in the Middle East specifically earmarked for energy investments in energy-deficient developing countries would go a long way to closing the energy gaps in energy-deficient regions.

Finally, there is equally wide scope for intra-regional co-operation on energy. One of the obvious examples is the development of a large-scale hydro-power station that may require the pooling of resources of several countries and their joint production and consumption to take advantage of the economies of scale. A less obvious example is the possible co-operation potential that could be exploited by a rational use of different sources of energy. Coal is a case in point. China (473 billion barrels of oil equivalent) and India (163 billion barrels of oil equivalent) together account for over 86 per cent of coal deposits in the South. This has one important energy strategy implication for Asia and the Pacific whose oil import requirements to fill its energy gap are quite substantial as emphasized earlier. To the extent that these two countries, which have a combined population of over 1.7 billion, rely on coal as a primary source of energy for industrialization, the demand pressures on other forms of energy, particularly oil, will be considerably relieved; and most important of all, as a result of domestic substitution of coal for oil, China could become a major oil exporter to its neighbouring oil-importing developing countries.

Notes

1/ See Report of the Second General Conference of the United Nations Industrial Development Organization (ID/CONF/3/31), chapter IV, "The Lima Declaration and Plan of Action on Industrial Development and Co-operation", para. 28.

2/ Decisions taken at the Meeting of Ministers of Industry of Developing Countries in Asia and the Pacific Region, held at Bangkok on 30 October 1974, at the Latin American Conference on Industrialization, held at Mexico from 25 to 29 November 1974 and at the first meeting of the Follow-up Committee on Industrialization in Africa, held at Addis Ababa, September 1974. The reconciliation was required because the target share of 10 per cent agreed on for the Asian and Pacific region did not include the Middle East, and that together with the share of 13.5 per cent agreed on for Latin America and the share of 2 per cent for Africa gives a total of 25.5 per cent, excluding the Middle East. See secretariat of UNIDO "Modelling the attainment of the Lima target: the LIDO model", Industry and Development, No. 6 (United Nations publication, Sales No. E.81.11.B.4), p. 6.

3/ For instance, see "A conceptual model for projecting industrial energy use in developing countries" (UNIDO/IS.278). The document also contains a bibliography of most of the previous econometric studies of energy consumption in developing countries.

Annex I

METHODOLOGY

A. Determination of Lima regional growth rates of GDP and MVA

Equations

North

- (1) $y_t^n = y_o^n e^{r_t^n}$; r^n exogenous y_t^n = North GDP in period t
- (2) $y_t^{nm} = b_t^{nm} y_t^n$; b^{nm} exogenous y_o^n = North GDP in the base period o
- (3) $r^{nm} = b^{nm} + r^n$ r^n = North GDP growth rate

South

- (4) $y_t^s = y_o^s e^{r_t^s}$ b_t^{nm} = North MVA share of GDP in period t
- (5) $y_t^{sm} = b_t^{sm} y_t^s$ r^{nm} = North MVA growth rate
- (6) $r^{sm} = b^{sm} + r^s$ b^{nm} = growth rate of North MVA share of GDP

i-th region in the South; i = 1, 2, 3, 4

- (7) $y_{it}^s = y_{io}^s e^{r_{it}^s}$ y_t^s = South GDP in period t
- (8) $y_{it}^{sm} = b_{it}^{sm} y_{it}^s$ r^s = South GDP growth rate
- (9) $y_{it}^s = a_{it}^s y_t^s$ y_t^{sm} = South MVA in period t
- b_t^{sm} = South MVA share of GDP

Equations (5), (8) and (9) give:

$$b^{sm} = \text{growth rate of South MVA share of GDP}$$

$$(10) \quad y_{it}^{sm} = b_{it}^{sm} y_{it}^s$$

$$= b_{it}^{sm} a_{it}^s (y_t^{sm}/b_t^{sm})$$

$$= [(b_{it}^{sm} a_{it}^s / b_t^{sm})] y_t^{sm}$$

$$= \phi_i y_t^{sm}$$

$$\text{where } \phi_i = (b_{it}^{sm} a_{it}^s) / b_t^{sm}$$

= i-th region's share of South MVA

However, from (10), we have

$$\sum_i y_{it}^{sm} = \sum_i \phi_i y_t^{sm} = y_t^{sm}$$

and hence

$$(11) \quad \sum_i \phi_i = \sum_i (b_{it}^{sm} a_{it}^s) / b_t^{sm} = 1$$

Therefore,

$$(12) \quad \sum_i b_{it}^{sm} a_{it}^s = b_t^{sm}$$

$$(13) \quad r_i^{sm} = b_i^{sm} + r_i^s$$

$$(14) \quad r_i^s = \dot{a}_i^s + r^s$$

substituting (14) into (13) and rearranging gives

$$(15) \quad (r_i^{sm} - r^{sm}) = (b_i^{sm} - b^{sm}) + \dot{a}_i^s$$

which represents the differential growth rates of MVA in different regions within the South.

r^{sm} = South MVA growth rate

y_{it}^s = GDP of i-th region of the South in period t

r_i^s = i-th region GDP growth rate

b_{it}^{sm} = i-th region MVA share of GDP in period t

a_{it}^s = i-th region share of South GDP

r_i^{sm} = i-th region MVA growth rate

b_i^{sm} = i-th region MVA share of GDP growth rate

\dot{a}_i^s = i-th region share of South GDP growth rate

T = year 2000

Π = Lima target, 25%

λ = South MVA as percentage of North MVA

$\dot{\lambda}$ = growth rate of λ

Lima target

$$(16) \quad y_T^{sm} = \pi (y_T^{sm} + y_T^{nm}); \quad \pi = .25$$

or

$$(17) \quad y_T^{sm} = \lambda y_T^{nm}$$

where $\lambda = \pi/(1-\pi) = 1/3$

Substituting (2) and (5) into (17) gives

$$(18) \quad y_T^s = \{(\lambda b_T^{nm})/b_T^{sm}\} y_T^n$$

or directly from (5)

$$(19) \quad y_T^s = (1/b_T^{sm}) y_T^{sm}$$

where y_T^{sm} is given by (17)

$$(20) \quad (a) \quad r^{sm} = \lambda + r^{nm}$$

$$(b) \quad r^s = \lambda + b^{nm} - b^{sm} + r^n$$

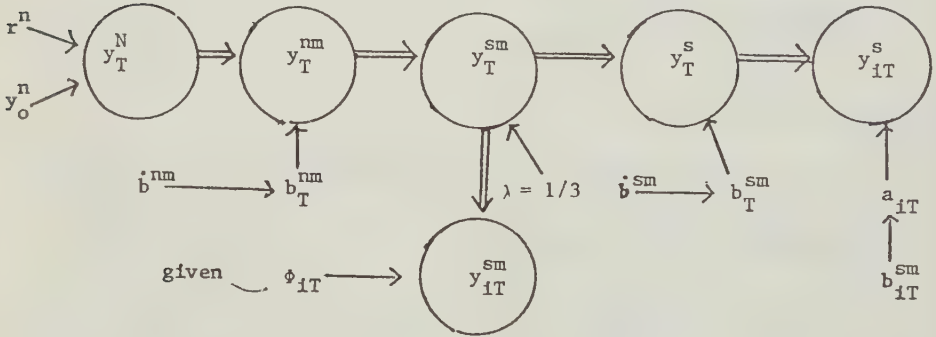
Algorithm

1. Given a GDP growth rate of the North for the period of 1980-2000 and the initial value of North GDP in 1980, equation (1) gives the North GDP in the year 2000 (y_T^n).
2. With an independently estimated MVA share of GDP for the North in the year 2000 b_T^{nm} , substituting y_T^n obtained in the previous step into equation (2) yields the North MVA in the year 2000 y_T^{nm} . An estimate of b_T^{nm} was obtained by using the North MVA-share-of-GDP growth rate observed in the period 1975-1980.
3. Given the values of y_T^{nm} and the Lima target share $\lambda = 1/3$, equation (17) gives the South Lima target MVA (y_T^{sm}).
4. The value of the South Lima GDP can be solved either in terms of y_T^{sm} obtained in the last step, using equation (19) or in terms of y_T^n using equation (18). The two approaches should provide the identical solution, but either solution requires the parameter value of South MVA share of GDP b_T^{sm} , which has to be independently estimated.
5. It is now straightforward to calculate each region's Lima target MVA, since each region's share is given: Africa, 2%; Middle East, 3%, Latin America, 13%; and Asia, 7%.

6. Finally, the calculation of each region's Lima target GDP is made. First, each region's GDP share parameter a_i needs to be estimated for this purpose from equation (10): $a_{iT} = \phi_{iT} b_T^{sm} / b_{iT}^{sm}$. The two variables in the numerator are already known. Therefore, once each region's MVA share of Lima GDP b_{iT}^{sm} is estimated, the GDP share parameter a_{iT} can be determined. The parameters b_{iT}^{sm} were estimated from historical values (1975-1980) of the growth rate of MVA share of GDP for each region.

7. Having determined the initial values (1980) and terminal values (2000) of MVA and GDP for each region, South, North and the world, the corresponding growth rates can be readily derived.

The algorithm can be summarized in the following schematic form:



B. Regional energy requirements for the attainment of the Lima target and the Lima energy gaps

Let the GDP elasticity of energy be defined by

$$(1) \quad \epsilon = (\Delta E/E) / (\Delta y/y) = \dot{E}/\dot{y}$$

where E is commercial energy consumption and y is GDP. Then we can derive from (1)

$$(2) \quad \dot{E} = \dot{y}$$

and

$$(3) \quad E_t = E_o (1 + \dot{E})^t$$

For regional energy production

$$(4) \quad P_t = P_o (1 + \rho)^t$$

where P is energy production and ρ is the production growth rate. Then the Lima energy gap is defined by

$$\begin{aligned}(5) \quad G &= P_T - E_T \\ &= P_0(1 + \rho)^{20} - E_0(1 + \epsilon)^{20}\end{aligned}$$

where the subscripts 0 and T denote the years 1980 and 2000 respectively.

Annex II

STATISTICAL TABLES

Table 13. GDP and MVA by region and group, 1975-1980
(Millions of 1975 dollars)

Region or group	1975	1976	1977	1978	1979	1980
A. <u>GDPa/</u>						
Developed countries	4 939 162 (30.65)	5 190 183 (31.53)	5 391 695 (31.97)	5 602 888 (31.85)	5 778 932 (32.06)	5 867 015 (31.12)
Developing countries	871 049 (17.94)	925 476 (18.17)	980 331 (18.11)	1 017 240 (18.57)	1 070 648 (18.85)	1 100 297 (18.97)
Latin America	372 251 (25.67)	389 722 (25.88)	407 034 (25.63)	423 523 (25.59)	446 443 (25.75)	472 339 (25.81)
Middle East	88 443 (7.29)	92 790 (7.53)	99 767 (7.65)	107 466 (7.94)	119 318 (7.69)	120 633 (8.33)
Asia and the Pacific	272 695 (15.41)	295 733 (16.19)	316 012 (16.57)	322 210 (17.97)	331 455 (18.83)	327 666 (18.63)
Africa	137 660 (8.88)	147 231 (8.30)	157 518 (8.40)	164 041 (8.64)	173 432 (8.81)	179 659 (8.76)
B. <u>MVA^{b/}</u>						
Developed countries	1 513 752 (90.64)	1 636 527 (90.68)	1 723 899 (90.66)	1 784 252 (90.42)	1 853 046 (90.18)	1 825 784 (89.73)

Developing countries	156 231 (9.36)	168 164 (9.32)	177 575 (9.34)	188 944 (9.58)	201 803 (9.82)	208 770 (10.26)
Latin America	95 542 (5.72)	100 862 (5.59)	104 331 (5.49)	100 372 (5.49)	114 943 (5.59)	121 933 (5.99)
Middle East	6 447 (0.39)	6 988 (0.39)	7 631 (0.40)	8 529 (0.43)	9 179 (0.45)	10 045 (0.49)
Asia and the Pacific	42 023 (2.52)	47 875 (2.65)	52 378 (2.75)	57 864 (2.93)	62 399 (3.0)	61 056 (3.0)
Africa	12 219 (0.73)	12 439 (0.69)	13 235 (0.70)	14 179 (0.72)	15 282 (0.74)	15 736 (0.77)

Sources: United Nations, "Handbook of world development statistics, 1982" (PPS/QIR/51982); SLANG print-out (J4163 W).

Note: The following countries and areas are excluded because of data unavailability:

- Developed countries: Iceland
- Latin America: Cuba
- Middle East: Bahrain, Democratic Yemen, Lebanon, Oman, Qatar, United Arab Emirates and Yemen
- Asia and the Pacific: Bhutan, Brunei, China, Cook Islands, Kiribati, Maldives, Mongolia, Nauru, Niue, Trust Territory of the Pacific Islands, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu and Viet Nam
- Africa: Sao Tome and Principe, Seychelles, Zaire and Zimbabwe

a/ Numbers in parentheses are MVA share of GDP (percentages).

b/ Numbers in parentheses are regional share of world MVA (percentages).

Table 14. Total final consumption of commercial energy by region and group, 1975-1980

Region or group	Amount (thousands of tonnes of oil equivalent)			Average annual growth rate (%)	
	1975	1978	1979		
World	4 709 592 (94.40)	5 235 693 (104.93)	5 416 846 (108.56)	5 357 722 (107.40)	2.61
Developed countries	4 268 455 (85.55)	4 684 476 (93.84)	4 829 567 (96.80)	4 742 242 (95.04)	2.13
Developing countries <u>a/</u>	441 137 (8.84)	551 217 (11.05)	587 279 (11.77)	615 480 (12.34)	6.89
Latin America	194 955 (3.91)	234 081 (4.69)	253 065 (5.07)	266 767 (5.35)	6.47
Middle East	32 963 (0.66)	44 350 (0.89)	51 480 (1.03)	55 444 (1.11)	10.96
Asia and the Pacific	179 095 (3.59)	216 426 (4.34)	229 519 (4.60)	232 963 (4.67)	5.40
Africa	34 124 (0.68)	56 360 (1.13)	53 215 (1.08)	60 306 (1.21)	12.06

Source: 1981 Yearbook of World Energy Statistics (United Nations publication, Sales No. E/F. 82. XVII. 16).

Notes: 1. Numbers in parentheses are millions of barrels of oil equivalent per day (mboed).

2. Commercial energy comprises solids, liquids, gas and electricity. Total final consumption is the sum of consumption by the different end use sectors and is equal to total energy required less transformation and distribution losses.

3. The following countries are excluded:

Latin America: Cuba

Middle East: Democratic Yemen, Lebanon, Oman, Yemen

Asia and the Pacific: Bhutan, Brunei, China, Kiribati, Maldives, Mongolia, Nauru, Niue, Trust Territory of the Pacific Islands, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu and Viet Nam

Africa: Lesotho, Sao Tome and Principe, Seychelles, Zaire and Zimbabwe

a/ The amounts shown do not include the commercial energy consumption of Asian centrally planned economies (mainly China), which, with around 8.4 mboed, accounted for almost 40 per cent of the total consumption of commercial energy in the developing countries in 1980.

Table 15. Production of commercial energy by region and group, 1970-1980

Region or group	Amount (thousands of tonnes of oil equivalent)				Average annual growth rate (%)			
	1970	1975	1978	1979	1980	1970-1975	1975-1980	1970-1980
World	4 572 733 (91.65)	5 162 308 (103.46)	5 704 411 (114.33)	5 988 197 (120.01)	5 888 402 (118.01)	2.46	2.67	2.56
Developed countries	3 161 549 (63.36)	3 475 795 (69.66)	3 776 857 (75.70)	3 960 651 (79.38)	4 028 292 (80.74)	1.91	2.99	2.45
Regional share	69.14%	67.33%	66.21%	66.14%	68.41%			
Developing countries	1 411 184 (28.28)	1 686 513 (33.80)	1 927 554 (38.63)	2 027 546 (40.64)	1 860 110 (37.28)	3.63	1.99	2.80
Regional share	30.86%	32.67%	33.79%	33.86%	31.59%			
Latin America	315 193 (6.32)	285 460 (5.72)	322 174 (6.46)	358 230 (7.18)	380 047 (7.62)	-1.96	5.89	1.89
Regional share	6.89%	5.53%	5.65%	5.98%	6.45%			
Middle East	503 371 (10.09)	713 343 (14.30)	828 346 (16.60)	958 428 (19.21)	891 563 (17.87)	7.22	4.56	5.88
Regional share	11.00%	13.82%	14.52%	16.00%	15.14%			
Asia and the Pacific	309 111 (6.20)	439 418 (8.81)	470 083 (9.42)	375 885 (7.53)	282 231 (5.66)	7.29	-8.47	-0.91
Regional share	6.76%	8.51%	8.24%	6.28%	4.79%			
Africa	283 509 (5.68)	248 292 (4.98)	306 951 (6.15)	335 003 (6.71)	306 269 (6.14)	-2.62	4.29	0.78
Regional share	6.20%	4.81%	5.38%	5.59%	5.20%			

Source: 1981 Yearbook of World Energy Statistics (United Nations publication, Sales No. E/F. 82. XVII. 16).

Notes: 1. Numbers in parentheses are production of commercial energy, which comprises solids, liquids, gas and electricity, expressed in millions of barrels of oil equivalent per day (mboed).

2. The following countries are excluded for reasons of compatibility with GDP and MVA data in each region. In Africa, a few more countries are excluded because of their negligible production volumes.

Latin America: Cuba

Middle East: Democratic Yemen, Lebanon, Oman and Yemen

Asia and the Pacific: Bhutan, Brunei, Cook Islands, Kiribati, Maldives, Nauru, Niue, Pacific Islands, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu, and centrally planned countries in Asia, except Democratic Kampuchea and Lao People's Democratic Republic

Africa: Benin, Botswana, Burkina Faso, Chad, Equatorial Guinea, Gambia, Guinea-Bissau, Mauritania, Niger, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, Somalia, Swaziland, Zaire and Zimbabwe

BOOKS

COTTAGE INDUSTRIES AND HANDICRAFTS: SOME GUIDELINES FOR EMPLOYMENT PROMOTION

by M. Allal and E. Chuta

Geneva, International Labour Office, 1982

Recognizing that the promotion of very small enterprises in the developing countries could lead to more employment and higher incomes in rural areas, the International Labour Office has prepared comprehensive guidelines for the establishment and operation of technical co-operation projects in this area.

The book is divided into eight chapters. In the introductory chapter, the objectives, scope and concepts of the guidelines are explained. The target group is defined as very small producers of goods and repair services, including artisans, producers of handicrafts, and village and cottage industries. It is also defined with reference to economic characteristics, i.e. self-employment, location in rural areas or in the urban informal sector, no specialization in management, labour-intensive techniques etc.

The second chapter deals with cottage industries and handicrafts and their contributions to employment and development. It includes as an annex a case study on the choice of techniques in the bread industry of Sierra Leone.

The third chapter relates programmes for cottage industries and handicrafts to the policy support measures required. It includes consideration of related industrial, monetary, fiscal, tariff and agricultural policies. The analysis takes into account policy changes required from time to time in response to changes in the economic environment, as well as competition.

The fourth chapter covers programme and institutional support and provides a comprehensive analysis of institutions and programmes relating to technical training, transfer of technology, management assistance, financing, export promotion, common facilities and co-operatives. Various strategies of programme design and methods of extension and training are also analysed. A case study of the Indian experience is included.

The next chapter deals comprehensively with programme formulation and evaluation, including the formulation of a development plan, selection of projects, criteria for the ranking of small enterprises prior to selection, evaluation of methodologies etc. Case studies are included on evaluation of a development programme for rural industries (again in India) and of International Labour Organisation (ILO) handicraft projects in selected developing countries.

In the next two chapters, on programme implementation, the role, functions and structure of promotion institutions are examined, including pilot production, training, marketing, quality control and supply institutions. Another case study is presented on carpet manufacture.

The final chapter deals with information needs for the design of projects. It includes a discussion of survey methods, data collection and data use. The inclusion of sample questionnaires will prove extremely useful.

A selected bibliography is included.

The guidelines will be extremely useful to experts (national and international), development administrators, planners, aid agencies etc. The analysis has been based on empirical evidence and on the field experience of ILO and other national and international agencies. While the guidelines are certainly useful, several questions could be raised regarding their applicability to development, especially in the less developed of the developing countries.

First, much of the empirical evidence and experience relates to Asia, and particularly to the subcontinent, where the range and size of enterprises vary widely and the role of government is predominant. The need for separate and comprehensive treatment of very small enterprises might be questioned. On the one hand, in many least developed countries, these are the only, or almost the only, enterprises to exist or to have potential. On the other hand, it has been recognized that even the establishment of rural industries cannot be isolated from the external environment, a rural-urban continuum often being advocated.

Secondly, institutions created or operated by Governments are often inefficient and ineffective. Many researchers have felt that in the precapitalist economies of many African countries, non-governmental and private institutions may be more successful.

Thirdly, with industrialization and modernization, the problem of transforming traditional activities rather than perpetuating them has to be squarely faced. For example, the employment hitherto provided by many crafts and cottage industries could be replaced by opportunities in the service sector, in both rural and urban areas. Furthermore, foreign exchange earned from the export of handicrafts is often acquired at considerable domestic cost in terms of subsidies provided to the exporters, which do not necessarily lead to equitable distribution.

S. NANJUNDAN

SMALL INDUSTRY IN DEVELOPING COUNTRIES - SOME ISSUES

by Dennis Anderson

World Bank Staff Working Paper No. 518

Washington D.C., World Bank 1983

Mr. Anderson's working paper, prepared during a sabbatical at Oxford, is divided into four parts. In the first part, internationally comparative data (Banerji 1978; Staley-Morse 1965) on small industries in the industrialization process are brought up to date and materials that have emerged over the last 15 years are reviewed in order to assess the changing size structure of industry by region and over time. Empirical evidence confirms that employment in household manufacturing declines first in relative and then in absolute terms as industrialization proceeds. However, the nature and composition of household manufacturing changes continuously. It includes a diversity of activities. Small workshops and factories emerge rapidly in response to the growth of markets, generally generated by agricultural growth. Large-scale industry eventually predominates, although much of it represents the growth of small firms to a medium or large size. Even though the general conclusions are valid, the author recognizes their limited application to many countries, especially African countries. In the view of this reviewer, data limitations apart, the peasant mode of the African economy often includes both agricultural and industrial activities within households, which again are sometimes divided between rural and urban areas. It is difficult to decide whether some types of informal activity should be assigned to the manufacturing or to the service sector. The author might profitably have carried the analysis further to determine the role of services in the schematic analysis of the household sector, the small-scale industry sector and the large industry sector.

The second part of the working paper relates to what is called "the entrepreneurship issue". While conceding the general argument that in developing countries the supply response to the demand for entrepreneurship has been sufficiently elastic to permit high rates of economic development, the author questions the efficiency of entrepreneurship and therefore the need to tackle this problem. The well-known deficiencies of small enterprises are analysed and it is concluded that attention needs to be paid to the entrepreneurial function in order to improve its efficiency. There may, however, be a confusion here between the efficiency required in the operation of an enterprise and the contrasting function of entrepreneurship - to be innovative, to take risks, to be flexible, to make best use of opportunities, to anticipate changes and respond to them. Efficiency should be regarded as a managerial function rather than an entrepreneurial one, even though in a typical small enterprise the two functions cannot be distinguished.

The third part of the paper deals with small industry programmes and their relation to development policy. On the basis of a retrospective analysis of experience, the author deals with questions of financing small industry in relation to extension and advisory services. Improved access to formal sources of finance linked to the provision of extension or advisory services reduces "x" inefficiency and increases marginal efficiency of capital. Policy questions concerning the relation of small industries

to employment and linkage between agriculture and industry are also discussed in this chapter. In regard to employment it is argued that restrictions on the types of activities to be assisted often impair the effectiveness of programmes. Some of the problems are due to the nature of "unemployment" in the developing countries. In regard to agro-industrial linkages, the point is made that investment in agriculture, by raising rural incomes and demands, elicits response through small-industry development. The point is also made (p. 62) that "a reduction in the unequal access to scarce economic inputs between the larger scale and small economic units would make the latter more competitive and increase their share of economic output, thereby raising the proportion of labour to capital employed in the manufacturing sector as a whole".

The final part of the paper provides additional conclusions: that the removal of unequal access to scarce economic inputs between the large-scale and the small-scale sectors should be accompanied by the removal of concessional terms for small-scale industry, as well as by a relaxation of administrative controls. Nevertheless, it is stated that there is a case for specific support programmes to small industries oriented to meeting their financial requirements and improving their efficiency.

S. NANJUNDAN

SMALL INDUSTRY - THE CHALLENGE OF THE EIGHTIES

by Ram K. Vepa

New Delhi, Vikas, 1983

Dr. Vepa, who is not only a prolific writer on the problems of small industries but has been (and still is) a practitioner in the development of such industries, has produced a comprehensive analysis of the present and future role of small industry the world over.

The book is divided into three parts. The first part, of about 150 pages, analyses recent developments in India in relation to small industry programmes and projects. It begins with a historical overview, which is followed by a discussion of the district industry centres programme and the credit programme. Thereafter, in a chapter entitled "Technology for the people", the applicability and limitations of Western technology are analysed. In this light, appropriate technology is advocated, meaning a judicious mix of technologies. The aspects of appropriate rural technology arising from the need for new sources of energy, e.g. biomass, solar, water and wind power, are discussed. In regard to rural technology, the requirements of agricultural equipment and implements, transportation, housing, water management, health etc. are analysed. The next two chapters in the first part deal with the marketing of decentralized sector products and the development of backward areas and mostly consist of a review of government policies and programmes.

The second part of the book analyses the role of programmes for small industry in Japan, China, East and South-East Asia, South Asia, Middle East, Africa and the West. The analyses are mainly descriptive and informative and would be useful to practitioners in small-industry development.

The concluding part of the book offers a perspective of small industry by the year 2000. The author advocates, presumably for India, an expansion of the concept of small industry to include not only manufacturing but also services and businesses, as well as handlooms, handicrafts, dairy, poultry and fishery, which are now handled separately by development agencies in India.

Dr. Vepa's book would provide useful information to those involved in programmes for the development of small industries. Serious scholars would probably have preferred to see more empirical data and more documentary references in the book, which, while containing a great deal of information, gives the impression that the latter has not been pre-digested and evaluated. Taking into account the limitations of government machinery, more attention to the role of non-governmental and private institutions might have been useful. Indeed, the perceptible shift towards the provision of consultancy and extension services by non-governmental and private institutions in India itself during the last 10 years has not been underlined.

In regard to the future of small industry, the author - who is also an electronics industry expert - could have analysed the effects of the microprocessor revolution, not only in its applicability to improving the management of small-scale enterprises but also in its broader applicability to economy and society through the operation of autonomous work centres and possibly through the closer integration of work and family.

S. NANJUNDAN

SMALL-SCALE INDUSTRY PROMOTION IN DEVELOPING COUNTRIES
by N. Molenaar, M. S. S. El-Namaki and M. P. van Dijk
Delft, Research Institute for Management Science, 1983

The Research Institute for Management Science (RVB) has published a selection of papers - with an introduction, summaries and conclusions - submitted to the Conference on Small-Scale Industry Problems and Prospects in Developing Countries, held at the Institute's headquarters at Delft in September 1983. The Conference brought together about 100 national and international experts and practitioners in the field of small-scale industries. Discussions were organized around four main subjects: the small enterprise support system; assistance to small entrepreneurs; the financing of small enterprises; and transfer of technology.

The volume is divided into six parts. The first part is an introduction and includes one of the theme papers by J. Levitsky of the World Bank on support systems for small-scale enterprises. The second part relates to small industry support systems and includes another theme paper by M. Harper on the development of entrepreneurship. It also includes a paper advocating a systems approach, presented by the Director of RVB, M. S. S. El-Namaki. The third part relates to assistance programmes for small-scale industry, including management and training and entrepreneurship. The fourth part is on the financing of small enterprises and the fifth part on the transfer of technology to small industries. The book concludes with a summary of the conclusions of the Conference.

It is appropriate that RVB should have taken the initiative to organize a conference of this nature, having had nearly 30 years' experience in international programmes for small-scale industry. At first glance, the scope and coverage of the book fall into a familiar pattern of top-down, comprehensive, all-embracing assistance programmes for small industry, intended to make up for its obvious size disadvantages compared with large industry. A closer study, however, does indicate new approaches and some emphasis on accentuating the functional advantages of small industry rather than trying to make up for its disadvantages through public programmes.

Looking back over the years, one is tempted to raise certain questions. For example, in what way does a conference of this nature in 1983 differ from one that could have been held 15 or 20 years ago? As already noted, the subjects covered appear to be more or less the same. A systems approach to small industry development is only a more scientific and sophisticated way of presenting what India used to advocate 25 years ago as a comprehensive integrated programme. The assumption that small industry per se is good for employment is, again, a hackneyed theme. The same applies to financing. Where, then, does the difference lie? There is a welcome absence of discussion on industrial estates as a means of collecting together small enterprises to derive the advantages of external economies as well as inter-firm trade. Also, attention is not devoted exclusively to the Indian experience, although one paper is devoted entirely to India and at least two other papers draw considerably on that country's experiences. A third noticeable difference is the shift in emphasis from intermediate or appropriate technology to transfer of technology.

While the Indian experience has been cited, it is not sufficiently realized that there has been a sea change in institutional support to small industries in India during the last 10 years or so. The paper by S. M. Palia brings this out to some extent. Even he, however, tends to emphasize governmental or institutional patronage to a greater extent than has been the fashion in the past. Important changes have included the application of commercial or market criteria to small-scale industries, the consequent growth of the more efficient enterprises into medium-sized enterprises and the increase in the use of private consultants (who are sometimes even paid by the public institutions).

A second misconception concerns the creation of entrepreneurs. Palia mentions the Gujarat case. While that programme has been highly successful, the premise that there has been a scarcity of entrepreneurs in that area is amusing, to say the least; those who know India and East Africa will appreciate that the Gujaratis are an entrepreneurial class by themselves. What the programme has done is to modernize entrepreneurs; much entrepreneurial training is really management training.

The problems of entrepreneurship in Africa are somewhat different and this is appreciated in several papers. Particularly relevant are the papers entitled: "The small entrepreneur really does know", by Molenaar, and "Policies for financing of small industries", by de la Rive Box. The difficulty in applying an "objective rationale" in a dualistic economy with a peasant mode of operation rather than a capitalist mode must be appreciated in programmes for the development of entrepreneurship, the provision of extension services and financing. Informal rather than formal arrangements may work better.*

Mention should also be made of the excellent paper by A. J. Young, entitled "Small business development constraints", in which the constraints of international aid are analysed. The author recognizes the basic difference in concepts of rationale between the national or international aid giver and the so-called aid recipient.

On the question of transfer of technology to small enterprises, G. K. Boon outlines the steps involved in making a choice between alternatives, de Groot describes problems in low-cost automation and van der Horst discusses institutional mechanisms. There is, however, a notable absence of discussion on the future of small enterprises in the computer age, which is not far off. The applicability of minicomputers and microcomputers to small enterprise management might have been a worthwhile subject for discussion.

*Further light is shed on this question in a recent book by Goran Hyden, No Short-cuts to Progress: African Management Development in Perspective (London, Heinemann, 1983).

The recent revival of international interest in small-scale industry has been partly due to the perception by donor countries of the problems of their own small enterprises. This has led to a concentration on endogenous rather than exogenous factors. Some discussion of the proper role of small industry within the economic system of different types of developing countries would have been helpful, and could have touched upon such questions as industrialization and rural development and the development of the service sector in developing countries. Small industry might thus have been placed in the perspective of a lateral continuum of economic activities. It is appreciated, however, that the subject was beyond the scope of the Conference.

On the whole, the publication will be found most useful by practitioners of small industry development.

S. NANJUNDAN

RECENT UNITED NATIONS PUBLICATIONS PREPARED BY THE DIVISION
FOR INDUSTRIAL STUDIES, UNIDO

INDUSTRY IN A CHANGING WORLD

Sales No. E.83.II.B.6. Price: \$18.00

This publication, a special issue of the Industrial Development Survey for the Fourth General Conference of UNIDO, reviews a wide range of subjects. World industry is described as being in a period of transition. The changing map of world industry is examined and some of the consequences of these shifts in industrial activity - in terms of national and international policies and the development of key industrial branches - are discussed. An important aspect of this transitional phase concerns the links between the manufacturing sector on the one hand and agriculture and services on the other hand. This subject is investigated in some detail, along with associated trends in employment and productivity.

The subsequent discussion in the Survey deals with more specific aspects that are closely related to the manufacturing sector. These include a survey of industrial strategies and policies in each of the developing regions, as well as in the developed market economies and the centrally planned economies. The relation between trade and manufacturing in the industrialization process is examined with emphasis on the cyclical pattern of trade performance, the role of industrial processing of natural resources and its relation to exports and the determinants of trade between various economic groupings.

Other specific topics that are the subject of individual chapters include an international comparison of wage levels within the manufacturing sector and in specific branches of that sector. Other chapters look at policies and strategies in key industries - namely, the agro-food industry, steel, machine tools, consumer electronics and petrochemicals. The Survey concludes with an analysis of comparative advantage and the methods used to measure this concept. Various measures are tested for specific industries, including steel, wood products and petroleum refining, and the consistency of the results are then evaluated.

WORLD NON-ELECTRICAL MACHINERY:
AN EMPIRICAL STUDY OF THE MACHINE-TOOL INDUSTRY
Sales No. 83.II.B.5. Price: \$12.00

This publication focuses on producers of machine-tools, surveying developments in this subsector against the broader field of the non-electrical machinery industry. The world-wide structure of firms is analysed, both from a long-term perspective and with regard to recent developments. The importance of trade performance and changes in comparative advantage is stressed. In this connection, the growth of world exports and their changing composition receive particular attention.

The publication begins with a comparison of predominant characteristics in the machine-tool subsector and the non-electrical machine industry. The diversity of products and the scale of operations is considered, along with measures of factor intensity and locational determinants of production capacity. The discussion then turns to world-wide trends in production, patterns of growth, trade performance and changes in comparative advantage.

More detailed evidence on the machine-tool subsector is also analysed. Patterns of technological development are surveyed and the constraints of these innovations for trade in machine-tools are examined. Intra-industry trade and evidence of market penetration also receive particular attention. The publication concludes with a look at recent developments in the machine-tool subsector in developing countries, along with some of the constraints on further progress in this important field and the prospects for the latter part of the 1980s.

INFORMATION FOR CONTRIBUTORS

The Supervisory Panel of *Industry and Development* welcomes contributions relevant to the stated aims and scope of the journal. Authors should contact the Supervisory Panel at the address given below.

1. Articles may be submitted in English, French or Spanish to:
Supervisory Panel of *Industry and Development*
Division for Industrial Studies, UNIDO
P.O. Box 300
A-1400 Vienna, Austria
2. Articles submitted should contain original, unpublished work not being considered for publication elsewhere.
3. The Supervisory Panel does not accept responsibility for loss of manuscripts.
4. Two copies of the manuscript should be submitted. It should be typewritten in double spacing on white bond paper, and all pages should be numbered consecutively.
5. The first page of the manuscript should contain the title, the name and institutional affiliation of the author, a summary of the article not exceeding 100 words, and the current address of the person to whom proofs may be sent.
6. Mathematical expressions should be numbered throughout the manuscript. If a derivation has been abbreviated, the full derivation should be presented on a separate sheet, which will not be published. The use of complex mathematics should be kept to a minimum.
7. Footnotes should be numbered consecutively throughout the text. References should include complete bibliographical data: author, full title of paper (or book), publisher, and place and date of publication. A reference to an article published in another journal should include that journal's full title, as well as the place and date of publication, author, volume number, issue number and page numbers. See a current issue of *Industry and Development* for the style employed for footnotes and references.
8. Illustrations and tables should be numbered consecutively throughout the text and provided with clear captions and labels.
9. Fifty offprints of their articles will be made available to authors.
10. Authors should note that, under United Nations publication rules, articles accepted for publication are subject to editorial review by the UNIDO secretariat.

كيفية الحصول على منشورات الأمم المتحدة

يسكن الحصول على منشورات الأمم المتحدة من المكتبات ودور التوزيع في جميع أنحاء العالم. استعلم عنها من المكتبة التي تتعامل معها أو اكتب إلى : الأمم المتحدة، قسم البيع في نيويورك أو في جنيف.

如何购取联合国出版物

联合国出版物在全世界各地的书店和经售处均有发售。请向书店询问或写信到纽约或日内瓦的联合国销售组。

HOW TO OBTAIN UNITED NATIONS PUBLICATIONS

United Nations publications may be obtained from bookstores and distributors throughout the world. Consult your bookstore or write to: United Nations, Sales Section, New York or Geneva.

COMMENT SE PROCURER LES PUBLICATIONS DES NATIONS UNIES

Les publications des Nations Unies sont en vente dans les librairies et les agences dépositaires du monde entier. Informez-vous auprès de votre libraire ou adressez-vous à : Nations Unies, Section des ventes, New York ou Genève.

КАК ПОЛУЧИТЬ ИЗДАНИЯ ОРГАНИЗАЦИИ ОБЪЕДИНЕННЫХ НАЦИЙ

Издания Организации Объединенных Наций можно купить в книжных магазинах и агентствах во всех районах мира. Наводите справки об изданиях в вашем книжном магазине или пишите по адресу: Организация Объединенных Наций, Секция по продаже изданий, Нью-Йорк или Женева.

COMO CONSEGUIR PUBLICACIONES DE LAS NACIONES UNIDAS

Las publicaciones de las Naciones Unidas están en venta en librerías y casas distribuidoras en todas partes del mundo. Consulte a su librero o diríjase a: Naciones Unidas, Sección de Ventas, Nueva York o Ginebra.